

2 ROMAN BOOK

ON PRECIOUS STONES



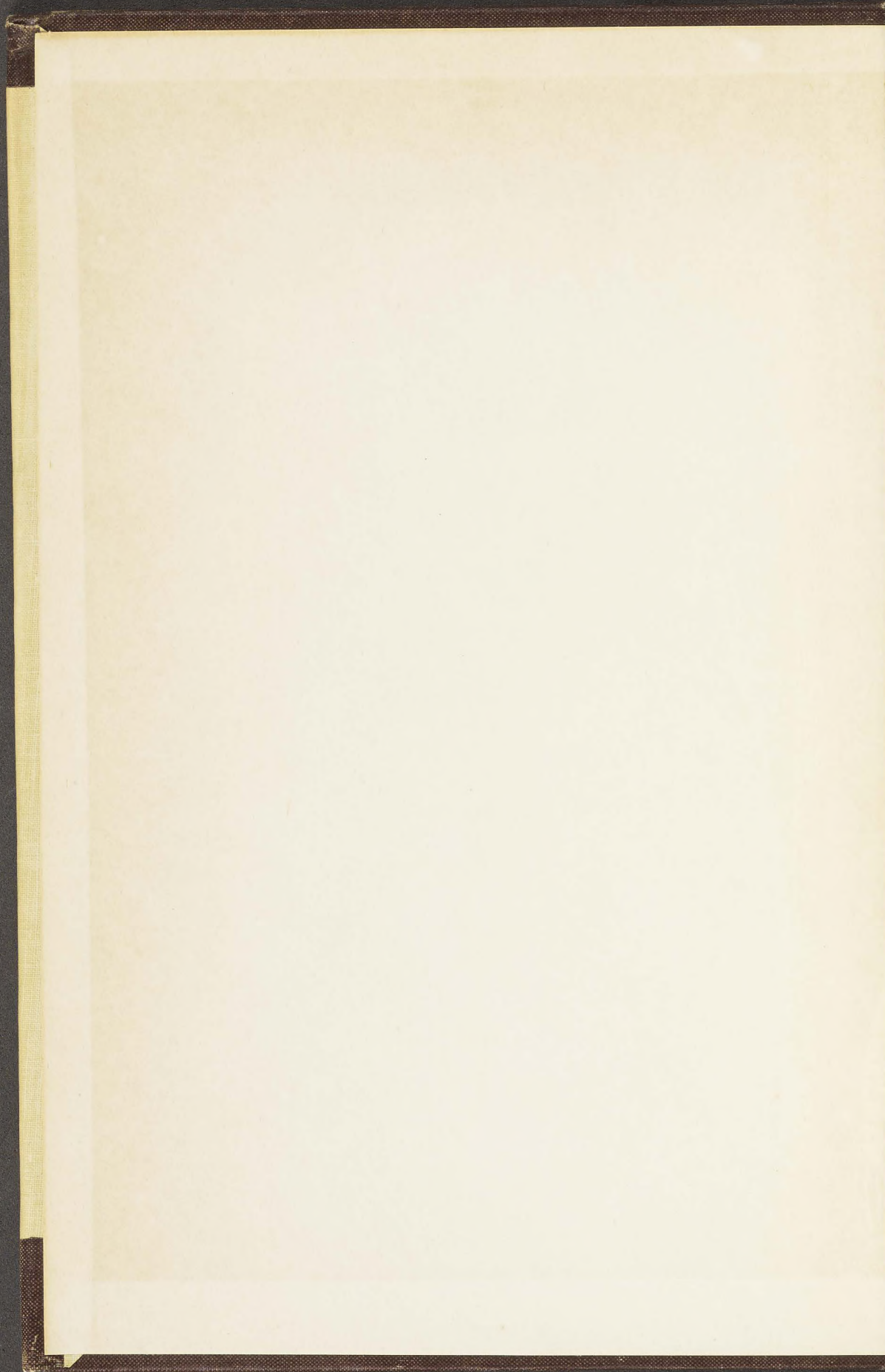
*Including an English
modernization of the
& 37th booke of the
HISTORIE of the WORLD*

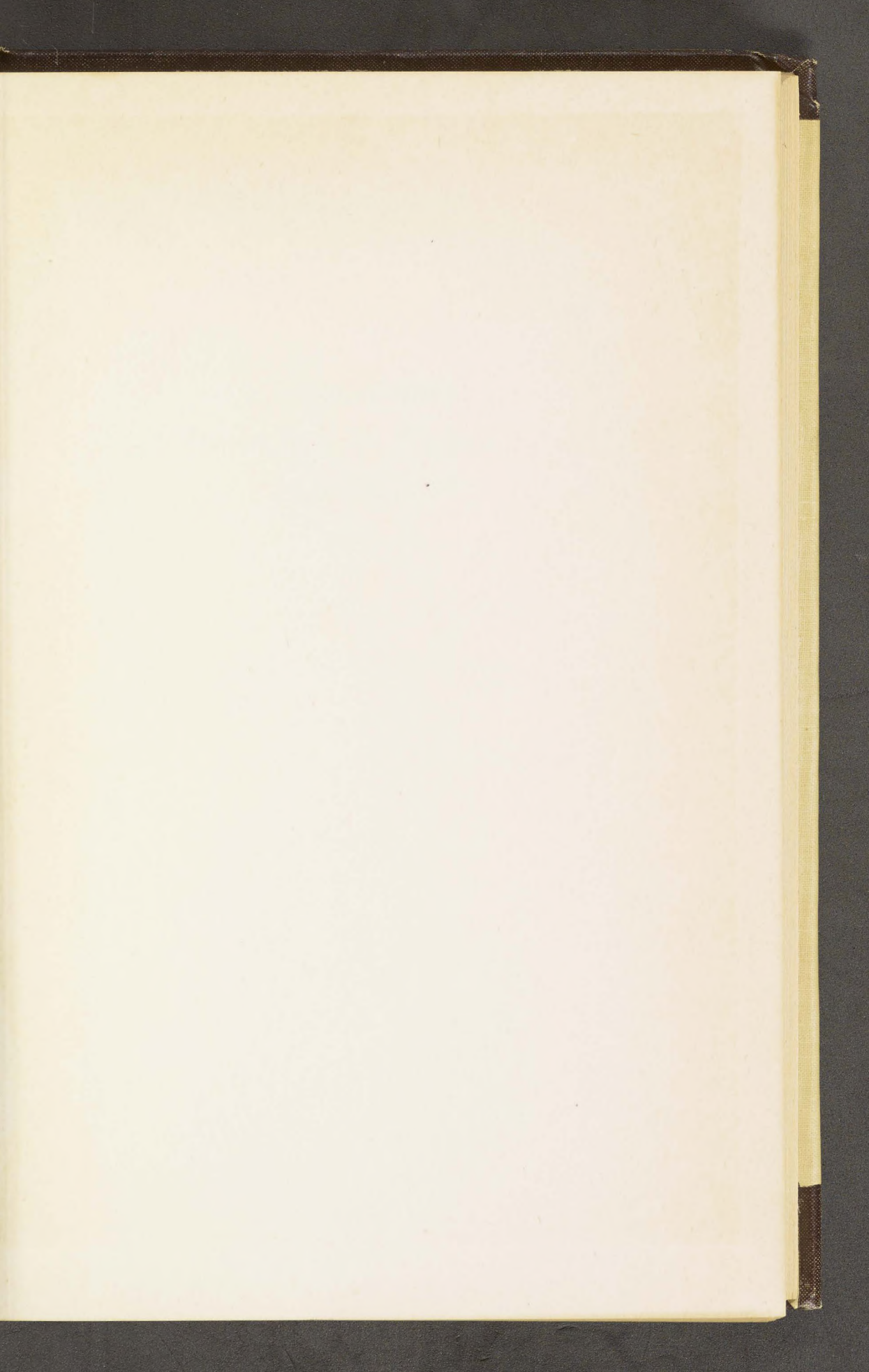
by

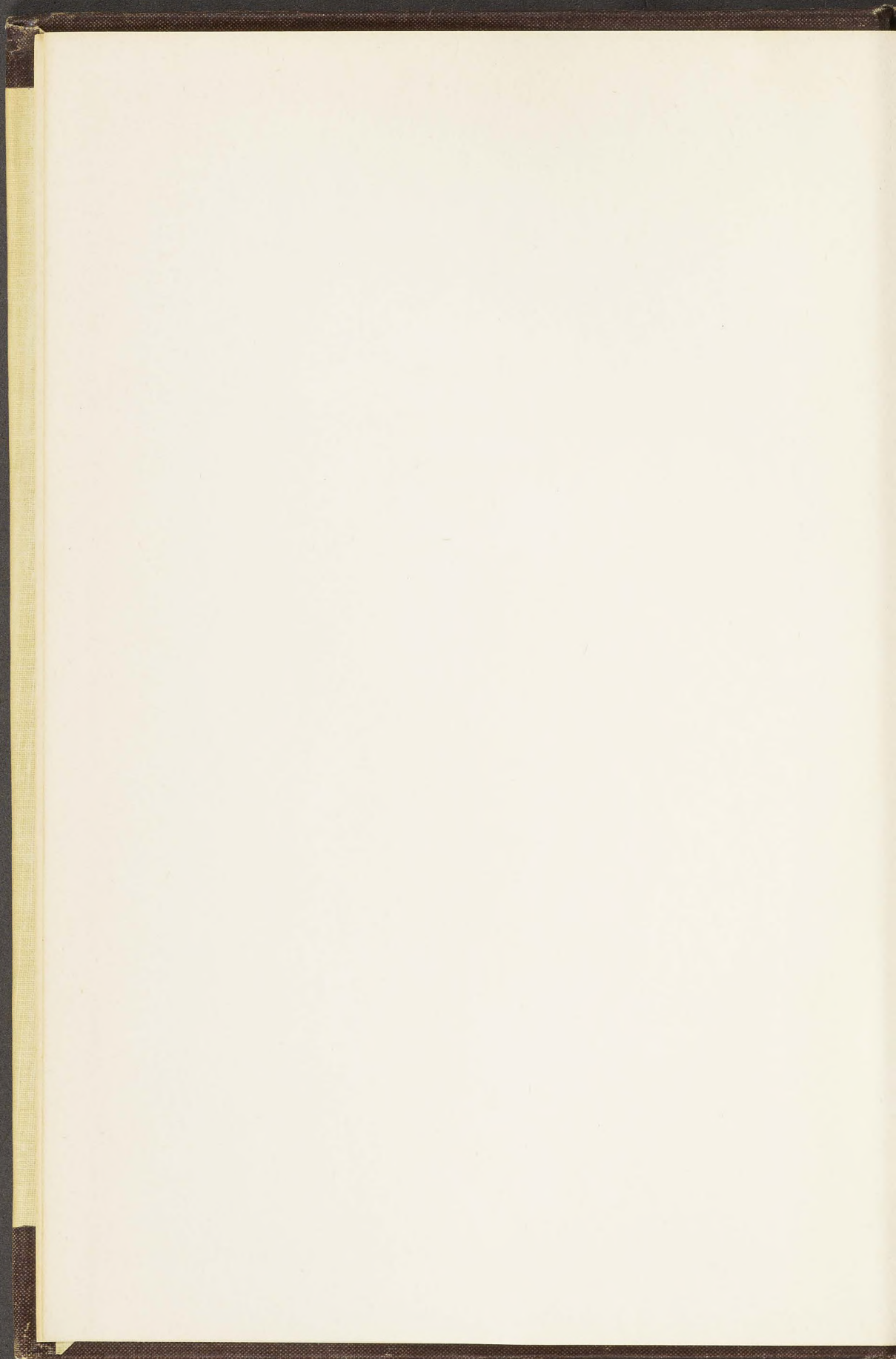
*C. Plinius
Secundus*



by SYDNEY H. BALL



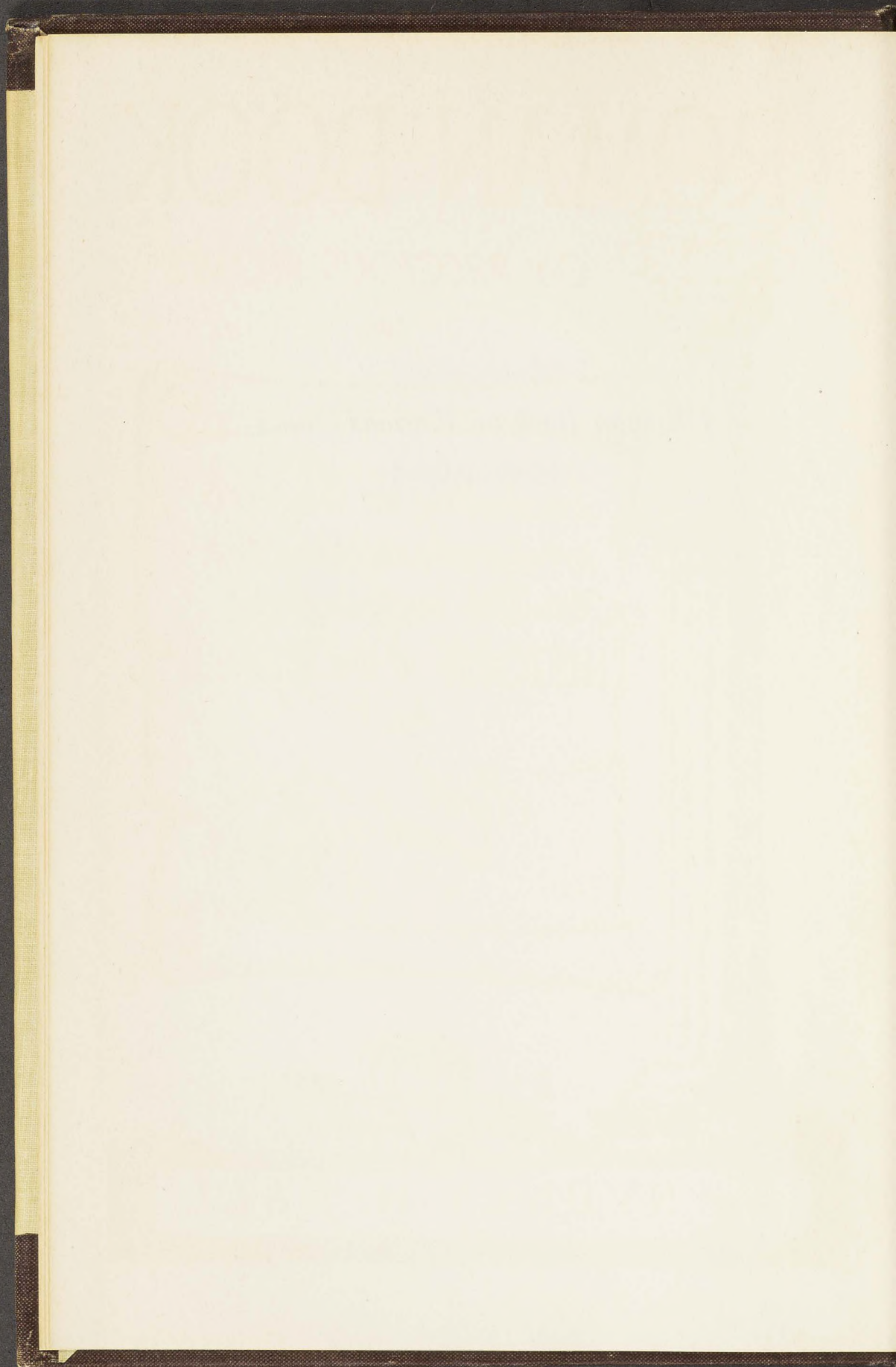






A Roman Book on Precious Stones





& ROMAN BOOK

ON PRECIOUS STONES



*Including an English
modernization of the
& 37th booke of the
HISTORIE of the WORLD*

by

*C. Plinius
Secundus*



by SYDNEY H. BALL

COPYRIGHT 1950

No part of this book may be reproduced
without written permission.

Published by the Gemological Institute of America, Los Angeles, an endowed, non-profit educational institution established in 1931 as a protection to the buying public through its scientific and literary research; public laboratories for gem identifications; and the dissemination of knowledge through books, a scientific periodical, and courses presently serving 3,000 students.



Printed in the United States of America.
by
LORRIN L. MORRISON
Los Angeles, California

Preface

IGHTLY or wrongly, I have for some years felt that the outstanding classical book on precious stones, the 37th book of Pliny's *Natural History*, has never been edited by one well versed in the lore of precious stones.

After years of disuse, my Latin limps; consequently, I take the liberty, to save the reader's busy time, of rendering into modern English what is generally considered to be at least one of the best English translations, that of Philemon Holland, published in London in 1601. (*The Historie of the World*, commonly called the *Naturall Historie of C. Plinius Secundus*. Translated into English by Philemon Holland, Doctor of Physicks. Printed in London by Adam Islip, 1601.)

Holland graduated from Trinity College, Cambridge, and later received his M. D. from an unknown university. While practicing his profession, he translated a dozen Greek and Latin works. That he was not overpaid is suggested by the fact that for one such arduous task he received £4; for another £5. Referring to his translations, Fuller in his *Worthies* says, "These books alone of his turning into English will make a country gentleman a competent library."

I have ventured, for easier reference, to disregard Holland's rather inadequate chapter headings and have introduced the more numerous and more logical headings in the Latin edition of Jean Hardouin (Joannes Hardiunus, Paris, 1723).

No work is complete, and this one is far from it. For the shortcomings of my modest part in this book, I can only claim indulgence. As for Holland's translation,

A ROMAN BOOK ON PRECIOUS STONES

my introductory chapters and notes were written in "those hours which might be spared from the practice of my profession and the necessarie cares of this life." I am in great debt to Miss Kay Swindler who edited my manuscript.

SYDNEY H. BALL

New York City, February, 1949



Foreword

ROME was not only the conserver of what was worth while in ancient days, but the dispenser of what has entered into modern life. She gathered together the precious metal of ancient civilization, fused and coined it anew, and put it once more into circulation. (Grant Showerman, *Eternal Rome*, Vol. II, p. 582.)



A ROMAN BOOK ON PRECIOUS STONES

Contents

SECTION I—Introductory Chapters

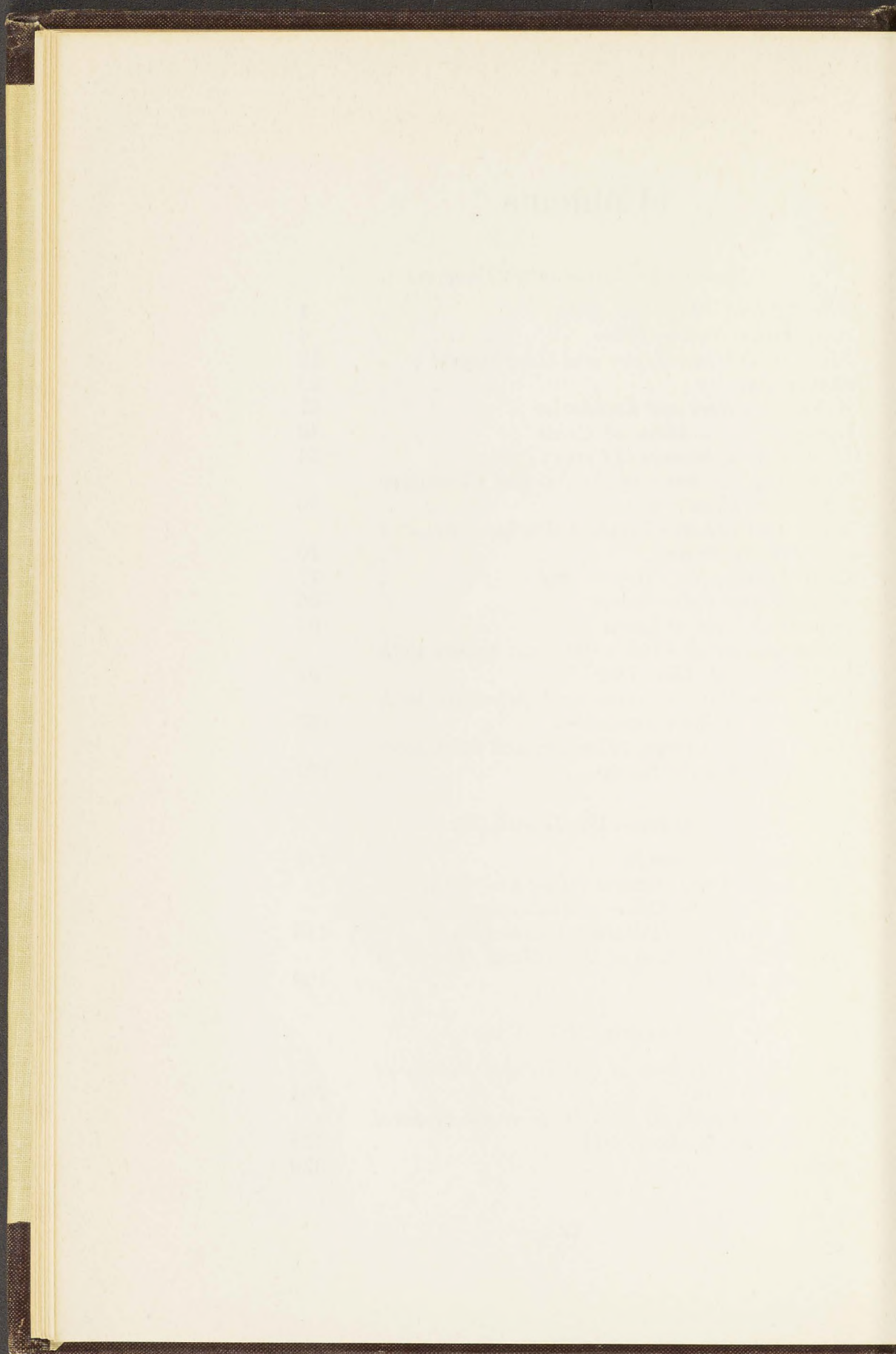
<i>The Author, Pliny the Elder</i>	1
<i>Authorities Cited by Pliny</i>	4
<i>Pliny as a Mineralogist and Gem Expert</i>	12
<i>Roman Jewelry</i>	23
<i>Roman Jewelers and Lapidaries</i>	37
<i>Geographical Sources of Gems</i>	48
<i>Geographical Sources of Gems (Table)</i>	54
<i>Historical Summary of the Ancient Commerce in Precious Stones</i>	56
<i>Value and Relative Rank of Precious Stones in Pliny's Time.</i>	70
<i>Gem Mining in Pliny's Day</i>	77
<i>Treated and False Stones</i>	80
<i>Industrial Uses of Gems</i>	84
<i>Identification of Pliny's Precious Stones with Those of Our Day</i>	87
<i>Table A—Pliny's Gems and Minerals with their Modern Equivalent</i>	89
<i>Table B—Gemstones, Minerals, and Substances with Pliny's Name</i>	102

SECTION II—Translation

<i>Foreword to Section II</i>	113
<i>37th Book of the Natural History of the World by Pliny the Elder—a Modernized Version of Philomen Holland's Translation</i>	115
<i>Appendix: 36th Book of the Natural History of the World</i>	198

SECTION III—Notes

<i>Notes: the 37th Book of the Natural History of the World</i>	203
<i>Notes: Appendix to 36th Book of the Natural History of the World</i>	325
<i>Index</i>	329



Section I



Introductory Chapters

A ROMAN BOOK ON PRECIOUS STONES

The Author, Pliny the Elder

CHAPTER I

AIUS PLINIUS SECUNDUS, born in 23 A. D. at Como, Italy, in what was then Transpadane Gaul, went as a boy to Rome. Reaching man's estate, he first practiced law but soon became a soldier and later a government official in Germany, Spain, France, and parts of Africa. He died a martyr to science in the 79 A. D. eruption of Vesuvius, the destroyer of Herculaneum and Pompeii.

The Romans, rather than advancing the sciences, applied them to useful work. Hence, it is not surprising that Pliny was not a creative scientist. He was, however, an indefatigable student and fact collector. While dressing, while at meals, or while bathing, he was read to. He never walked, but rode, so that his reading would not be interrupted. Previous to writing the *Natural History*, he made copious notes from more than 2,000 books. His nephew, Pliny the Younger, himself no means a laggard, says compared to his uncle, "I am an idle vagabond."

The books of Pliny, listed by the latter,* show his catholic taste; biographies, histories of the German wars; a treatise on javelin throwing; a book entitled *The Student*; and his *Natural History*, the 37th and last book of which is hereafter presented. Of his literary works, the *Natural History*, dedicated to the Emperor Titus, alone survives. At least the initial ten books were first published in 77 A. D.

The *Natural History* is encyclopedic in scope, a comprehensive and erudite compendium of the classical knowledge and, in instances, the myths of astronomy,

* *Epistles* III

A ROMAN BOOK ON PRECIOUS STONES

meteorology, geology, zoology, botany, materia medica, art, mineralogy, and other sciences and arts. As Pliny the Younger said, it is "not less varied than nature itself." In it are preserved for us the scientific knowledge of both Greek and Roman, the essence of numberless books which no longer exist or have only come down to us in a fragmentary condition. As Greek science stemmed from Egypt and to a lesser extent from Babylonia, some of the scientific lore of those countries is also presented. Pliny was a compiler rather than a scientific observer or a great philosophical scientist and his material, in instances, is poorly digested. He is not overly critical for he stated that "no book is so bad but that some good might be got out of it." No single mortal, however, could be expected to be a specialist in each of the many sciences covered by the *Natural History*. The singular or the extraordinary attracted Pliny although he often rightfully dismissed as incredible some of the statements made by the scientific leaders of his time. With Ssu-ma Ch'ien, whose *Shih chi** appeared in 100 B. C., Pliny might have said: "My narrative consists of no more than a systematization of the material that has been handed down to us. There is, therefore, no creation; only a faithful representation."

* *Historical Memoirs.*

He is careful to credit the source of his information for, as he says in his dedication, "we would pay homage to those whose learning and knowledge are useful to us."

The *Natural History* reveals the author as a very human person. The overindulgence of his fellow Romans in luxuries excites his wrathful scorn and his concern for the economic future of the empire, due to the wealth of gold and silver sent to India in exchange for luxuries, proved only too real. In a highly sarcastic vein, he observes that, notwithstanding that sharks guard the world's wealth of pearls, the gentler sex obtains them and, in a half humorous vein, he wonders what worth while purpose amber serves.

His style is usually prosaic, but he occasionally becomes a poet, as when he describes the opal.

Pliny, in his 33rd book, treats of precious metals; in

The Author, Pliny the Elder

his 34th book, of the base metals; in his 35th book, of painting and the ochres and other colors used in that art; in his 36th book, of the marbles and other materials used in sculpture and in building; and in his 37th book, of precious stones.

In the Dark and Middle Ages, Pliny's *Natural History* was the foundation of all science. The old Italian metallurgist, Vannoccio Biringuccio (1480-1539), in his *Pirotechnia** scorns those who are not familiar with Pliny and Albertus Magnus, "both of whom, like eager hunting dogs, have always journeyed throughout all regions and shores of the world, seeking with all possible care to understand the wonders and powers of Nature." Dr. Philemon Holland (1601), our translator, states in his preface: "He hath discoursed of all things even from the starrie heaven to the centre of the earth."

Buffon (18th century), while recognizing that the *Natural History* is a compilation, avers that the work has been so skillfully done "that it is preferable to most of the original works that treat upon similar subjects."* Edward Gibbon (1737-94), in the 13th chapter of *The Decline and Fall of the Roman Empire*, refers to Pliny's work as "that immense register where Pliny has deposited the discoveries, the arts, and the errors of mankind." Cuvier, the great French scientist of the early 19th century, calls the *Natural History* "one of the most precious monuments that has come down to us from ancient times."

* Translation by C. S. Smith and M. T. Gnudi, A. I. M. E., New York, 1943, p. 36.

* *Premier Discours sur l'Histoire Naturelle.*

Authorities Cited by Pliny

CHAPTER II



WHILE Pliny was evidently a student of precious stones, his 37th book is largely a compilation, some forty authorities being cited. One of the striking innovations of the *Natural History* as a classical work is Book I, consisting of a table of contents of each of the succeeding thirty-six books and the authors, Roman and foreign, to whom Pliny is indebted for some, at least, of the data contained in each book. As to Book XXXVII, Pliny states, "in the book are set down 1300 facts, romantic stories and scientific observations" compiled from the following authors, Roman and foreign (which the editor has arranged alphabetically):

* *Records of Triumphs.*

ROMAN AUTHORS: Cornelius Bocchus, Maecenas,* M. Varro.

FOREIGN AUTHORS: Aeschylus, Alexander Polyhistor, Apion, King Archelaus, Asarubas, Callistratus, Chares, Ctesias, Democritus, Demonstratus, Euripides, Ismenias, King Juba, Metrodorus, Mithridates, Mnaseas, Nicander, Nicias, Olympicus, Philemon, Philoxenus, Pytheas, Satyrus, Sophocles, Sotacus, Sudines, Theochrestos, Theophrastus, Timaeus the Sicilian, Xenocrates the son of Zeno, Zachalias, Zenothemis, Zoroaster.

In time, the authors who furnished material for the 37th book range from the 6th century B. C. to Pliny's own time, Xenocrates, a Greek doctor, and Asarubas being our author's contemporaries. As to nationality, although Pliny scoffs at the "frivolities and falsehoods of the Greeks" slightly more than half appear to be

Authorities Cited by Pliny

Greeks; nine are Romans; six are from Asia Minor; two from Egypt; three from other parts of Africa; one from Persia; and one from Babylonia (and more than likely a Jew).

That the Romans cited are few is not strange as they were more frequently soldiers and civil servants than scientists. As a class, Pliny also mentions the magicians and their "detestable lies." Some of our author's authorities are historians giving the time at which a certain gem reached Rome; others are poets, most of whom in Pliny's opinion used much license in their reference to precious stones. Still others are geographers who incidentally mention the habitat of a gem; while others, writers of medical books, treat of the supposed medicinal virtues of precious stones, usually to the annoyance of Pliny.

Some of these authorities, however, wrote books on precious stones: certainly the following did: Sudines; Theophrastus; Sotacus; King Archelaus; Callistratus; Ismenias; Satyrus; Zenothemis; Maecenas; Nicias of Malles (also referred to by the Pseudo-Plutarch and Stobaeus); Zachalias; and also, according to report, probably Zoroaster. Further, according to Galen, Xenocrates, a contemporary of Pliny, wrote a book on precious stones. This is presumably Xenocrates, the Ephesian and the son of Zeno, mentioned by Pliny as the latest writer on amber known to him. Of these authors, the earliest is Sotacus who probably lived before the time of Alexander the Great and is believed to have been a physician at the Persian court. Pliny frequently quotes him, but Sotacus seems to take certain eastern legends too seriously.

Unfortunately but one of these books has come down to us—Theophrastus' *History of Stones*,* written about 315 B. C. Theophrastus is frequently and deferentially quoted by Pliny. We should perhaps also mention the Orphic work *Lithica*, a didactic poem on the magic powers of stones. This is often ascribed to Onomacritus (530-480 B. C.), the Orphic priest and seer, but much more likely dates from the 4th century A. D.

* Translation by John Hill, London, 1746.

A ROMAN BOOK ON PRECIOUS STONES

Theophrastus, the great disciple of Aristotle, describes the minerals used in the arts and in industry in his day and, rather incidentally, the gemstones known to the Greeks of his time. The *History of Stones* is more the result of research and less of compilation than is the *Natural History*. Theophrastus, the scientist, attempts to explain the origin of minerals, water being the basis of metals and earth of stones. He classifies minerals into metals, earths, and stones (the last including gems); a classification generally accepted until the end of the 18th century of our era. Descriptions of precious stones make up about one fourth of the brief treatise as it has come down to us. As physical properties of stones he recognizes fracture, color, transparency, luster, hardness, weight, and fusibility. Theophrastus knew that certain gems were harder than iron and only to be cut by other gems. He also recognized that minerals varied greatly in size and that all true gems were small. He gives the localities from which gems are obtained and expatiates on the high prices which certain of them bring. He describes the emerald, the garnet and other red gemstones, amber, alabaster, lapis lazuli, jasper, onyx, agate, carnelian, amethyst, rock crystal, prase, chrysocolla, malachite, magnetite, and hematite. Theophrastus names others less easy to identify: [*omphax*, *hyaloides*, *lampsacus*, and *lapis lyncurius* (possibly tourmaline)]. Among the infusible gems uninjured by fire, he mentions *adamas*, probably not our diamond, but at least one of those minerals which had certain of its characteristics, or supposed characteristics. Theophrastus evidently compiled his work in part from previous writers on gems, including Babylonian writers. Usually contented to state "they say," he nevertheless specifically quotes Diocles.* Diocles was born at Carystus in Euboea in the 4th century B. C. He belonged to the medical sect of the Dogmatici and wrote medical treatises of which but fragments exist today.

* Hill translation,
London, 1746, p.
77.

Many of Theophrastus' conclusions are surprisingly accurate: the pearl is a product of the oyster; coral is a stone-like product which grows in the sea. The exist-

Authorities Cited by Pliny

ence of fossil ivory is noted; the whetstone and the gems cut into seals in his time (i.e. those of the quartz family, largely) are similar substances. He knew that by heating limonitic ochres, red ochres resulted. The gems known to him came only from Europe, Northern Africa, and Western Asia.

Pliny obtained many facts and some myths from Theophrastus, notably that *adamas* is not injured by fire;* the high price of agate in former days;* some stones are too hard to be engraved by iron;* that some stones bring forth young, but Theophrastus cautiously adds "if the accounts are true";* that certain stones burn if sprinkled with water; that the *carbunculus* is incombustible;* that *sapphiros* (lapis lazuli) is spotted with "gold" (iron pyrite);* that the emerald, if placed in water, colors it, and that the emerald rests the eyes;* that tremendously large emeralds exist;* that a stone from Cyprus consists half of *smaragdus* and half of jasper, the former being an altered form of the latter;* that Bactrian emeralds were collected when the Etesian winds prevail;* that *lyncurium* (Pliny's *lychnis*) attracts leaves, straws, and thin plates of copper and iron, and that it is the urine of the lynx;* that gems have sex (carnelian, *lyncurium*, and *cyanos*); that the agate comes from the river Achates in Sicily;* that mirrors are made from the *carbunculus* from Orchominus;* that *carbunculus* (garnet probably) comes from Massilia; and that artificial *caerulium* (Pliny's *cyanos*) was first made by a king of Egypt. Pliny's debt to Theophrastus is great.

We would probably never have known more of classical gem lore had not Pliny's more informative 37th book come down to us.

Archelaus was made king of Cappadocia by Marcus Antonius in 36 B. C. and died an old man in Rome in 17 A. D. Plutarch states that he or another king of the same name wrote a treatise on minerals and from Pliny we know he had a sound knowledge of the gems of Africa and Asia. Strabo* states that in Cappadocia (Asia Minor) fine crystal and onyx were "discovered by the miners of Archelaus near the country of the

* Book XXXVII,
Ch. 15.
* Book XXXVII,
Ch. 54.
* Book XXXVII,
Ch. 76.
* Book XXXVI,
Ch. 29, etc.

* Book XXXVII,
Ch. 25.
* Book XXXVII,
Ch. 39.
* Book XXXVII,
Ch. 16.
* Book XXXVII,
Ch. 19.

* Book XXXVII,
Ch. 19.

* Book XXXVII,
Ch. 17.

* Book XXXVII,
Ch. 13.

* Book XXXVII,
Ch. 53.

* Book XXXVII,
Ch. 25.

* Book XII, Ch. 2,
Part 10.

A ROMAN BOOK ON PRECIOUS STONES

Galatians." This king was hence the most popular of all men among mining engineers, a mining adventurer, and an empire builder.

Callistratus and Ismenias (a contemporary of Alexander the Great), while less frequently quoted than Theophrastus, seem to have been relatively reliable, while Nicias was an authority, and an unreliable one, on amber. Zachalias dedicated his book to King Mithridates, who himself was also a great gem lover and possibly a writer on precious stones and certainly of a book on poisons.

As to Baltic amber, Pliny quotes a Mithridates, but I doubt if this is the renowned King of Pontus. Zachalias was apparently a mystic, believing that man's destiny was controlled by certain properties possessed by gems. Consequently, he was a firm believer in the medicinal virtues of gems. Sudines does not appear to be a particularly reliable authority. The observations on gems of Xenocrates, the Ephesian already mentioned, being matter of fact, are valuable. His specialties were amber and crystal. Democritus (about 420 B. C.) had a wide knowledge of precious stones and emphasizes their medicinal virtues. Petronius says Democritus "spent his days in the laboratory, fearing that some virtue in stone or shrub might be lost to humanity." The Roman, Cornelius Bocchus (his name suggests he was a Berber), had accurate information as to the precious stones of Spain and Portugal. Maecenas (about 74-8 B. C.), that great gem lover, is said by C. Suetonius Tranquillus to have written a book on natural history dealing largely with precious stones. This has unfortunately disappeared. He is particularly remembered since, fond as he was of his emeralds and pearls, they could not compensate him for the death of Horace. Augustus,* in a letter to Maecenas, takes sly digs at his love for gems. Maecenas, according to Dion, was entrusted by Augustus with his seal, he being to all intents and purposes Lord High Chancellor of the Roman Empire.

* *Microbius* II, 4.

Satyros appears to have been an Alexandrian gem engraver and writer on precious stones in the time of

Authorities Cited by Pliny

Ptolemy Philadelphus (309-246 B. C.). Diodorus describes a portrait of Arsinoe engraved by him in crystal. Pytheas of Massilia and Timaeus are quoted by Pliny on the Prussian amber deposits. The former (340 B. C.), a great navigator, wrote two books, *On the Ocean* and *Periplus* (a log book from Gades to the Tanais) (the Elbe?). Strabo's characterization of him as "unreliable," "a liar," and "a charlatan" was as unfair and unwarranted as was the medieval criticism of Marco Polo. Timaeus of Tauromenium, the historian, was the son of Andromachus and flourished about 264 B. C. He wrote on the medicines derived from metals. Due to his character, he was called "Eipitimaus" (the Reviler). Chares, an officer under Alexander the Great, wrote anecdotes of his chief and descriptions of his campaigns. Mnaseas, born at Patara, Lycia, in the 2nd century B. C. was a great traveler and a voluminous writer on geography. Nicander, a Greek physician (about 185-135 B. C.) wrote poems on poisons and their antidotes and on venomous reptiles. Most of these are lost but two have come down to us, the longest being *Theriaca*, treating of venomous reptiles and the wounds they inflict. The fumes of jet, he tells us, was a remedy for the black plague. Pliny mentions him in but one place. Cornelius Alexander, called Polyhistor (138-78 B. C.), a Greek born in Asia Minor, wrote a comprehensive description of the lands known in his day.

Metrodorus, while possibly the one whom Pliny* states wrote a book on architecture, is more likely to be Metrodorus of Scepsis, famous as an orator and frequently referred to by Cicero. Known as the "Roman hater," he wrote a geographical work quoted by Pliny in Book III. Strabo* mentions a book of his "on customs" and states that what he says therein regarding the Arabian Gulf is wholly unreliable. From what we know of his knowledge of precious stones, we may guess he was none too accurate as to them. Metrodorus, first a philosopher, later became a politician and was for a time a courtier of Mithridates Eupator, but finally deserted him.* Philemon and Menander, who fre-

* Book XXXVI.

* Book XVI, Ch. 4,
Article 16.

* Strabo, Book XIII,
Ch. 1, Article 55.

quently mention carnelian in their comedies, were bitter rivals in writing the New Greek comedies early in the 4th century B. C. The Philemon who is quoted several times by Pliny on amber, may be another person, and possibly the Graeco-Roman gem engraver of Roman Empire times. A cameo ascribed to him portrays Theseus and a slain Minotaur.

Apion, an Egyptian, whom Pliny states he had seen in his youth, was a historian and described the wonders of Egypt. He was surnamed Plistonices, because he was so contentious. A man of considerable learning and an eloquent speaker, he was ostentatious and vain. He was one of the first Jew baiters. Pliny* ridicules Apion's belief in the supernatural. No wonder, Apion describes a statue nine cubits high cut from a single *smaragdus*.* Olympicus, a physician, probably lived in the 1st century of our era.

* Book XXX.

* Book XXXVII,
Ch. 19.

King Juba (carried to Rome as a child about 46 B. C. and one of the most learned men of his day) and King Archelaus are Pliny's authorities on the gem deposits of northern Africa, Arabia, and Asia Minor, while Pliny depends for his knowledge of Indian stones upon Satyrus, Demostratus, Sotacus, Ismenias, Ctesias the Cnidian, and Zenothemis. The latter, who wrote a *Periplus* full of marvelous tales, may well have visited India, while Ctesias (flourished 415-397 B. C.) had doubtless talked with merchants in the Indian trade. He wrote a description of India (*Indika*), some fragments of which, thanks to Photius, exist today.

Pliny quotes Herodotus (born 484 B. C.) in some of the earlier books of the *Natural History*, but not in Book XXXVII. The same remark is true of Agatharchides (2nd century B. C.) and Strabo, the Greek geographer (about 65 B. C.-21 A. D.). Each of the latter two wrote well known descriptions of the peridot deposit of the Island of Zamargat, but Pliny in his description follows King Juba and King Archelaus.

Dioscorides wrote his famous *Materia Medica* about 50 A. D. His remarks about minerals treat largely of their medicinal virtues, but in some instances he gives short descriptions of them. Few of these mentioned

Authorities Cited by Pliny

are gems. Pliny, strangely enough, does not mention Dioscorides. As he was punctilious about giving others credit when due, it is remotely possible that he did not know his writings. In Book IV, Chapter 31, Pliny refers to a Dionysius. This can scarcely refer to Dionysius Periegetes, but must be another of a large clan. Periegetes, the author of *Description of the World*, probably postdated Pliny.

In that curious work of *The Names of Rivers and Mountains and of such things as are to be found therein*,* the author—certainly not Plutarch—possibly the grammarian Parthenius (70-19 B. C.), Virgil's teacher, describes a number of precious stones most of which never existed and refers to a number of writers on stones, most of whom Pliny would label as magicians. The author, however, refers to the *First Book of Stones* by Archelaus (probably Pliny's King Archelaus); the *Fourth Book of Stones* by Agatharchides, the first to describe the Red Sea peridot occurrence; the *Book of Stones* of Nicias Mallotes, and he also states that Ctesias "wrote not only a *First* but a *Second Book of Mountains*."

This commentator must mention an author, Pliny's junior by a century and a half, Gaius Julius Solinus. In his *Collectanea Rerum Memorabilium** are listed gem localities by countries. While more probably a compiler than a gem merchant, his knowledge of precious stones was broad and in one or two instances his more accurate descriptions supplement the less detailed ones of Pliny.

* Plutarch's Works,
Wm. W. Goodwin,
6th edition. Boston,
1888, Vol. 5,
pp. 477-509.

* English translation,
A. Golding, 1587.

Pliny as a Mineralogist and Gem Expert

CHAPTER III

 PLINY meticulously compiled and carefully coordinated the knowledge of precious stones of his time, and for more than 1600 years after his death books on precious stones were little more than copies of his works. Only within the past 200 years have mineralogists progressed much beyond his concepts. We should, however, mention the brilliant Arabian mineralogist, Mohammed Ben Mansur (12th century) who, in certain subjects, surpassed Pliny, and perhaps also that other Arabian mineralogist, Tiefeschi, (13th century). Only rarely does Pliny nod as when, in Book XXXVII in different chapters, he describes and redescribes the *paederos*, evidently the opal. In instances he apparently also includes several minerals under a single name and, like ourselves, gives separate names to differently colored members of the same mineral. Further, he places Indian asbestos in the vegetable kingdom.* Grecian asbestos, on the other hand, he considers a mineral.* Normally, he is distinctly scornful of precious stone myths but one brought up in the Roman religion of his time must have had his superstitions. So, we find that the diamond cannot be broken on the anvil and can only be conquered by the warm blood of a he-goat and that certain millstones deteriorate under the action of the moon. Pliny, however, fairly hoots at the magicians who state that amethyst will keep one sober and at the geographic and other

* Book XIX.

* Book XXXVII.

Pliny As a Mineralogist and Gem Expert

errors of the Greek poets regarding the sources of amber.

Like many other gemstone authorities, he divides gems into "the more noble gems" and "those of inferior quality," thus paralleling the nomenclature in good standing until recently of "precious" and "semiprecious" stones. Indeed, some of us today in dividing precious stones into the "noble gems" and the "lesser gems" have unconsciously plagiarized Pliny, for the author believes that a substance is or is not precious and that "semiprecious" is a nondescript and meaningless term.

Pliny is interested in the nomenclature of gems. In the latter part of his book he notes that a number of gems are named after parts of the body, after animals or other natural objects; others derive their names from their colors; and still others from objects with which they have some physical similarity. As to the terminations of the names of minerals, the common mineralogical terminations of today then existed: "ites" (for example, *tenites*), "itis" or "ene" (for example, *nipparene*), while other suffixes were also in use. Pliny rightly protests against the introduction of new names for each slight variant of a mineral, such as the number of spots or lines thereof or slight differences of color.

Little or no chemistry or crystallography was known in his time. In consequence, classification of gemstones was largely by color and we find the ruby, spinel, and garnet grouped under *carbunculus* and the purple gemstones under *amethystos*. Pliny, however, recognizes the close relationship of magnetite and hematite* and of gypsum and limestone.* He states that beryls and emeralds "are of the same nature," "or at least closely analogous"; that carnelian is not unlike sardonyx; that bloodstone is a variety of plasma or prase; iris "is partly composed of crystal"; and one of his varieties of *amethystos* "borders" very closely upon that of crystal. He therefore, in recognizing the family relationship of rock crystal, amethyst, and iris, makes a beginning of mineral classification.

Crystallography was a more important tool to Pliny than chemistry and in a number of instances the form

* Book XXXVI.

* Book XXXVI.

A ROMAN BOOK ON PRECIOUS STONES

of a gemstone is given as one of its characteristics. Pliny describes the six sides and six angles of rock crystals; he states that the polish of its natural faces cannot be equalled by the lapidary. *Pangonus* (possibly colorless topaz) would be taken for rock crystal were it not for its greater number of angles.

The only real diamond Pliny knew was that of India; the octahedron being usually considered the dominant form of Indian diamonds and by all authorities one of the predominant forms. Could one find a better description of an octahedron than that of Pliny, as if two truncated tops had their flat ends joined together? He refers to the elongated form of the beryl of India and we of today know the slenderness of some of its prisms. *Androdamus* is always square and cubical in shape. Pliny also recognized that crystals occur in groups. Of *gallacos* he says normally two or three occur together. He admired the perfection of certain crystal faces as when he refers, in addition to rock crystal,* to the faces of the diamond from India being smooth. (Such crystals, called *naifes*, have always been highly prized by the Hindus and, uncut, are mounted in jewelry.) Again false stones are characterized by a "certain roughness on the surface." Pliny evidently has in mind the smoothness of crystal surfaces or that of waterworn gem pebbles.

* See previous paragraph.

* Book XXXVI.

* Book XXXIII.

He knew of cleavage for the specular stone* (largely selenite, in part mica) and that it can readily be divided into plates as thin as one desires. He recognized that gems vary in toughness and that certain gems are brittle and when set in rings are likely to break* if dropped, especially if the setting is heavy. He reveals that the surfaces of gemstones differ in character, for wax adheres to the *carchedonia* (an African garnet) if used as a seal, while on the contrary the carnelian is excellent as a signet stone.

Pliny knew gemstones vary in hardness; the diamond's hardness is described as "wonderful and unnatural" and diamond splinters were treasured by engravers, permitting them to cut easily the hardest gem-

Pliny As a Mineralogist and Gem Expert

stones known. Two degenerate varieties of *adamas* however can be perforated by other kinds of *adamas*. The *craterites* (yellow sapphire?) is "exceedingly hard" while *jovis gemma* (meerschaum?) is soft and the *sandastros* (aventurine feldspar?) according to Ismenias could not be polished due to its extreme softness. *Topazos* (peridot) alone of the more noble precious stones, is "polished with the iron file" and "wears with usage." An experienced jeweler of today would not set a peridot in a ring because of the stone's softness.

The stones grouped under *carbunculus* (ruby, spinel, and garnet) can be differentiated from their glass imitations with the touchstone, the imitations being "always of a softer nature and comparatively brittle." Indeed, in differentiating gemstones from counterfeits the best mode of testing is to grind a small fragment on an iron sheet; but gem dealers do not permit this and also refuse to let their gems be tested with the file. Dust of obsidian will not leave a mark upon the surface of a genuine stone; but on imitation stones, each mark leaves a white scratch. To sum up, there is such a vast diversity in degrees of hardness of gems that some stones can be engraved by iron; others do not admit of being so cut; others can only be cut with a graver blunted at the edge; but all precious stones may be cut and polished by the aid of *adamas* (diamond).

Legend says Archimedes was the first to recognize specific gravity when, in his bath, he was testing the crown of Hiero the Second. It was then he cried, "Eureka, eureka, I have found it." "It," the law of specific gravity, has been a potent tool of the mineralogist since that early day. Only fragments of Agatharchides' (about 181-146 B. C.) description of the Red Sea have come down to us, but in his fascinating description of the Aethiopian gold mines he states that, in milling the ore, the finely crushed product is placed in a sluice and that the particles "which contain the gold hang back, owing to their weight," and from them the free gold is recovered. Pliny's first test for differentiating

genuine precious stones from glass imitations is weight, for ordinarily the genuine stone is heavier than the false. Elsewhere he says that the *chryselectrum* (citrine) of Pontus is known "by its lightness." Amber "thrown upon the Prussian coast is almost as light as water." In fact, amber is only slightly heavier than water and if it contains air-filled vesicles or the water about it moves rapidly, it floats.

Pliny also knew of the various degrees of transparency of gems: "all transparent stones should be tested in the morning," or never after the fourth hour (10 A. M.). Ovid* adds: "Consult the daylight about jewels, about wool steeped in purple; consult the daylight also about the figure and proportions" (of a woman). In describing the *sarda* (carnelian) Pliny states "the Indian stones are transparent, those of Arabia being less so." *Sapphiros* (lapis lazuli), he states, is never transparent. In some colored gems, he recognizes that the translucency varies with the thickness of the stone.

* *Ars Amatoria*,
Book I, line 251.

Color, as we have already said, is the characteristic used by Pliny in classifying most precious stones. Daubenton* as late as 1780 used the same criterion. Bergmann (1792) and Haüy in 1817 were the first to use more scientific methods. Pliny was a close observer of color; his poetical description of the opal proving this. The uneven distribution of color in gems was also known to him for he says that piercing some Indian beryls improves their color, the white substance within being thus removed. Pliny also knew that the color of some gemstones fades for, regarding the *smaragdus* of the Attican silver mines (without much doubt our smithsonite), he states that some deteriorate with age gradually losing their lively green color and, in the sun, lose their luster. I, however, cannot find that smithsonite is one of the minerals which fade. Referring to *callaina* (turquoise), he correctly states that it loses its color if in contact with oil, unguents, or wine. We hope turquoise wearers, today, realize that oils and perspiration should not come in contact with their gems.

* *Tableau Methodique
des Mineraux*.

Pliny As a Mineralogist and Gem Expert

As to luster, Pliny says that the great defect of *jaspis* (jasper) in his opinion is its subdued appearance and its want of luster.

Apparently Pliny did not know that the powder of certain colored stones was white, but Posidonius (135-50 B. C.) states that the red rock salt of Galicia, Spain, crushes to a white powder.

As to fusibility, Pliny states that the diamond "conquers the fire's fury." The *apyroti** (incombustible), applied to a *carbunculus*, is correct if the stone be a ruby. Amber, he knew, burned.

* Ch. 25.

Pliny recognizes that gems are poor conductors of heat, for regarding *leucochrysos* (possibly an inferior topaz), he tells us that excellent glass counterfeits are made; the touch, however, tells the difference, "the imitation being less cold than the real stone."* Of the *sarda* (carnelian) he says "no other precious stone tarnishes more speedily when exposed to moisture":* carnelian being cool, quickly condenses moisture. He rather overreaches himself when he states that the *adamas* (diamond) "is incapable of being heated." The Romans used crystal balls to cool their brows and rings cut from rock crystal to cool their hands; at least such was the custom during the Lower Empire.

* See also Ch. 76.

* Ch. 31.

As to magnetism, Pliny knew that magnetite is magnetic and that it transmitted this characteristic to iron and to iron alone. The closely related iron ore *haematites* (hematite) is not magnetic.* Pliny errs, however, when he states that the diamond nullifies the magnetic effects of the lodestone. This may be some queer quirk of the fact that in early classical times *adamas* referred to iron and even to the magnet, or to the fact that the diamond, if rubbed with a cloth, develops positive electricity and will attract tiny fragments of paper.

* Ch. 25.

Regarding the electrical properties of amber, he states that when heated by rubbing it between the fingers, amber will "draw chaff, straws, dried leaves, and slivers of the linden or tillet tree bark, just in the

same way that the lodestone attracts iron." From Nicias, he learns that the Syrians hence call it *harpax*, comparable to the Dutch name given tourmaline in 1703, *aschen-trecker* (ash-drawer). *Lychnis* (either tourmaline or topaz, probably former) when heated or rubbed between the fingers "will draw to them straws, threads, and paper shred."

A few minerals, fluorspar and fetic quartz, under certain conditions, give off odors and Pliny says of *murrhine* vessels that they are in part esteemed for the odor exuding from them.* I would rather doubt that the smell of ozone producing headache and intense nausea among German fluorspar miners could properly be called a pleasant odor, but this together with Pliny's statement that a person of consular rank so loved his *murrhine* cup "as to bite out a piece," leads me to surmise that *murrha* is a collective noun, including agate, chalcedony, and fluorspar. Pliny states that jet "emits a disagreeable odor when rubbed"* and that amber "emits a pine-like smell when rubbed" and a resinous smell when burnt.* Martial† describes the perfume "which is exhaled—by amber rubbed with the hand."* In the latter third of Book XXXVII, Pliny describes a number of "stones" with odor or the powders of which have taste. For instance, under "agate," he describes a variety, *autachates*, with a pleasant scent (I cannot place it). Some of these statements are figments of the imagination although some of the substances described are not minerals but artificial compounds imported from the East. It will be remembered that Megasthenes,* one of our earliest authorities on India (302 B.C.), speaks of the delicious taste of a kind of Indian crystal, sweeter than figs or honey, (our rock sugar).*

Pliny knew that gemstones have inclusions: for when one shakes the *enhygros* (our enhydros), a liquid is heard to move within, as when the yolk within an egg is shaken. Further, one of his tests of glass imitations is that now used to differentiate sapphires from synthetic sapphires; blisters and filaments within the fictitious stone. He describes also ants, gnats, and lizards

* Ch. 8.

* Book XXXVI.

* Ch. 2.

† *Epigrams*, Book III, Ep. 65.

* Also Book V, Ep. 37 and Book XI, Ep. 8.

* Strabo, Vol. XV, Ch. 37.

* Possibly Pliny's *Libanochrus*, Ch. 62.

Pliny As a Mineralogist and Gem Expert

in amber, which must have adhered to it while liquid and upon its hardening been enclosed within. The inclusion of lizards suggests that even in his day some gem dealers were shrewd fakers.

In the descriptions of the more noble gems, he describes their flaws, uneven color, lack of transparency, spots, pale color, the presence therein of extraneous matter, etc. Emeralds may lack clarity, they are "blind" stones: others are covered with clouds which gives the stone a whitish hue. Again filaments are visible in the stone. The beryl is also "disfigured by spots and filaments"; it may be of a pale color or it may have cloudy spots "like those on the fingernail."

Pliny says little as to the association and occurrence of gems. He notes, however, that rock crystal and *chryseletrum* (yellow crystal, citrine) are mined from the same pits in Spain. Likewise, he notes the association of diamonds and gold—the two as we know being associated in almost all alluvial diamond deposits. His description of the occurrence of turquoise protruding from the rock "like eyes" and slightly adhering to the rock, not as though it formed "an integral part of it" but as if it had been placed there, expresses rather accurately the marked contrast of the nodules of turquoise and country rock in certain turquoise deposits known to the writer. His description of the carnelian nodules which stick out of the rock "like a heart" is excellent.

Pliny was scarcely a deep philosopher so far as the origin of minerals is concerned and Theophrastus' views on the subject were more logical. Indeed, Book XXXVII is less satisfactory on this subject than on any other and here the superstition of Pliny's time and his lack of discrimination in compilation are well exemplified. As to the origin of amber, however, he was uncannily correct, for he knew it to be a resin of trees belonging to the pine family. It would appear, however, that he believed the tree to be of a living species. The myth of the Phaethon sisters suggests a much earlier belief in the vegetable origin of amber. Crystal, from its appearance and occurrence, in instances, in high mountains

like the Alps, was considered frozen rain water or snow. This belief was widespread in ancient times and is still prevalent among the Afghans, the Eskimos of Alaska, and the Ojibway Indians. *Murrha*, on the other hand, was a moist substance thickened by the earth's natural heat. Specular stone (selenite largely) was a liquid congealed to an ice-like crystal. Indeed, the marrow of bones falling in the shafts turned into specular stones in a single winter. He learns from Papirius Fabianus that marble, in Italy, grows in the quarry, the workmen assuring us "that the wounds inflicted upon the mountains" in quarrying "fill up spontaneously."* Pliny thus had an inkling that water in some form was an agent in the formation of at least certain minerals.

* Book XXXVI.

That certain stones are transmuted into one another was a belief of ancient times. Copying Theophrastus, Pliny mentions a mineral one half of *smaragdus* and one half of *jaspis*, the liquid in which had not as yet entirely transformed the jasper to emerald. This belief persisted until about a century ago and plasma is still sometimes called "root of emerald." Pliny not only believed that gemstones were either "male" or "female," but he goes further and states "Theophrastus and Mucianus are of the opinion that there are certain stones which bring forth other stones."* Again he quotes Metrodorus who apparently attributed certain sex characteristics to *paneros*. He quotes another authority, *paeanitis* (also called *gemonides*) conceives, as does *gassidane*:* a fact which is proved when it is shaken: "it conceives every three months." Presumably these were concretions from the inner walls of which fragments had broken. Probably similar was the *cytis*, in which the rattling of the embryo may be heard on shaking it. While Pliny is careful to quote others as proof that stones reproduce their like, he presumably had a feeling that the myth might be true: one common to scientists of the Middle Ages and still believed by some of the less civilized people of the earth.

* Book XXXVI.

* Ch. 59.

Aetites is found in the nest of eagles, two together,

Pliny As a Mineralogist and Gem Expert

the male and the female. They assist the birds to propagate, and in consequence there are never more than two eaglets. The various varieties of this stone, probably a geode or concretion, have wonderful medicinal virtues. A confused form of this eastern legend is that the Arabian turquoise is found in the nests of birds known as *melancoryphus*.

Falling stars—an awesome sight to semicivilized man—may well have given the authority quoted by Pliny the idea that *glossopetra* (fossil shark tooth) “falls from the heavens during the moon’s eclipse.”* *Brontea* (probably prehistoric arrowheads) also falls “with the thunder” and it quenches fires started by lightning. That prehistoric axes and arrowheads (*ceraunia* in part) fall from heaven and protect the possessor and his chattels from lightning is still a common idea among semicivilized peoples. *Ombria* (also called *notia*) “falls with showers and lightning” and has similar virtues.*

The ancients considered meteoric iron sacred because it came from the heavens (some of the ancient names of iron mean “metal from heaven”) and many of the miraculous swords of folklore were forged from iron meteorites. Modern chemical analyses indicate that the earliest iron weapons were made of meteoric iron. The Nasamonians, African natives, believed that the *carchedonia* (probably a garnet) is produced “by a divine dew or a heavenly rain shower.” The Chinese today ascribe a like origin to the Shantung diamonds. The belief of the modern natives of Madagascar that the crystal used in their divination fell from the heavens is not dissimilar.*

Pliny doubts that the gem *lyncurium* (probably topaz or tourmaline)* exists and is skeptical as to some of its reported characteristics. The ancient belief expressed by Theophrastus that it is the urine of the lynx, hardened in the ground, was probably mnemonic, due to its color.

Pliny’s description from Sotacus of the recovery of the *draconites* or *dracontia* from the head of a dragon

* Ch. 59.

* For details see notes on *ceraunia*.

* Andrew Lang, *The Making of Religion*, London, 1898, pp. 91-2.

* Book XXXVII, also Book VIII.

A ROMAN BOOK ON PRECIOUS STONES

goes back to ancient Eastern folk tales of gems, usually the garnet, in the heads of dragons or serpents.

In Book XXXVII, Pliny relates with contempt some of the ancients' ideas as to the origin of amber: that it is the tears of poplar trees into which Phaethon's sisters had been transformed: that it is the urine of the lynx:* that it exudes from stones: that it is sweat produced by the rays of the sun as it shines on the soil at sunset: that it is the slime of a lake: that it is a scum of the ocean foam coagulated (Pytheas): and that it is the tears of certain birds, the *meleagrides*.

* Theophrastus ascribes this origin to *lapis lyncurius*.

Roman Jewelry

CHAPTER IV

OMAN jewelry was founded on Etruscan styles and production methods. Later it was influenced by Greek artisans and modes; indeed, many of the terms of the Roman trade were of Greek origin. Eventually the pupil far outstripped the master—at least in one respect, barbaric display.

Herodotus (5th century B.C.) states that each Babylonian had his seal. Signets even among the Greeks date from early times. Solon (638-556 B.C.) had seen the evils of seal counterfeiting while traveling in Egypt and on his return to Greece he sponsored a law forbidding gem engravers from keeping copies of the signets they had cut. Xenophon the Greek states (401-400 B.C.) that rings set with an intaglio were worn by many of his fellow soldiers. At that time in Greece, ring wearing, other than that of a signet, was considered effeminate and Aristophanes (about 444-380 B.C.)* scoffs at the gilded youths of his day who loaded their fingers up to their nails with onyx seal rings. The quarrel between Plato and Aristotle apparently began when Plato criticized Aristotle's luxurious clothes and his numerous rings.* The signet, however, served other purposes and apparently assisted young Roman lovers for Albius Tibullus (he died 19 B.C.) sings: "Many a time on the plea of judging her gem and its image can I remember how I touched her hand."

The Romans* were originally a simple and rustic people who considered the wearing of jewelry unmanly. Their neighbors, the Sabines, who early amalgamated with the Romans, on the other hand, wore much

* *Clouds* 331-2.

* *Aelian* III, 19.

* I, VI, lines 25-6, in his poem to *Delia*, translation by J. P. Postgate, Loeb Classical Library, London, 1931.

* Book XXXVII, Ch. 6.

A ROMAN BOOK ON PRECIOUS STONES

jewelry. Dionysius of Halicarnassus says of the Sabines that they wore "bracelets on their left arms and rings, for they were a gold-wearing nation and not less effeminate than the Etruscans." In our childhood we learned the story of Tarpeia* the fair but traitorous daughter of the keeper of the citadel on the Tarpeian hill, in the 8th century B. C. Fascinated by the golden armlets of the Sabines, then attacking the citadel, she bargained with them, promising to open the gates "if they would give her what they wore upon their left arms." Both parties lived up to their respective agreements—Tarpeia was smothered under an avalanche of shields. Niebuhr states that it is a widespread myth in Rome that Tarpeia still sits resplendent with gold and jewels, motionless under a spell, in a cavern in the center of a Roman hill.

Plunder gained in war and increasing commerce with other peoples, however, changed the viewpoint of the Romans, although jewelry as we know it was first worn only a few centuries before Pliny's time. Iron rings were in common use in the early times but solely as an indication of warlike prowess.* Rings at first were strictly utilitarian, serving as signets. Roman seal rings date back at least to the early years of the 6th century B. C. Cleostrata, the wife of an old Athenian, says to her slaves: "Seal fast the storerooms, bring back the signet to me."*

Once, when Alexander the Great was reading a letter from his mother, Hephaestion, sitting next to him, thoughtlessly looked over his shoulder and read it. Alexander did not reprove him but clasped his signet over his mouth, indicating that his lips were sealed.* The conservative Roman wore his signet, but no other jewelry, and in case of accident the seal was a ready means of identification. The Cornelian law, enacted by Cornelius Sulla, the dictator, decreed banishment for those who used a seal to forge a will. Valerius Fabrianus, for forging the will of Domitius Balbus, was banished in Nero's time.* But to the fop, the sky was the limit and, as the Empire aged, the conservative became the exception and the fop the common species.

* Propertius El. IV, 4;
Varro, Lim. Lat. Vol.
41.

* Book XXXIII, Ch. 4.

* Casina, Act II, Scene
I, *The Comedies of
Plautus*; translator
Bonnell Thornton,
London, 1769; also
Amphitryon, Act II,
Scene 2; also *The
Three Pieces of
Money*, Act III,
Scene 4. See also
Matthew 27:66, and
Daniel 6:17.

* Plutarch, *Miscellane-
ous and Essays*, Wm.
H. Goodwin, Boston,
1888, Vol. I, p. 489.

* Tacitus, Book XVI,
Ch. 40.

Roman Jewelry

The signet was tied in with the owner's position; hence we find Augustus (23 B.C.), when sick to death of a fever, handing his ring to Agrippa, indicating his desire that the latter succeed him. Aristophanes* states that stewards used their masters' signet. When not in use, the signet was deposited in a place of security, as Juvenal (55-138 A. D.) says: "In ivory cabinet securely kept."* Articles of value were sealed with the owner's seal and theoretically protected.* The seal could, however, be abused. Counterfeiting is by no means an invention of the 20th century. Juvenal* describes six slaves reclining in a stately palanquin:

*"To whom a few short lines, authentic made
By a forged seal, inheritance convey'd."*

Rings, first among the Greeks and later among the Romans, in addition to their decorative value, had a medicinal value; a gold ring engraved with a fish, for example, warded off the colic.

Tarquinius Priscus (616-578 B.C.) was the first to present his son with a golden *bullā*, an amulet of Etruscan origin. Although at first worn only by the children of patrician magistrates who had sat in the curule chair, its use soon became less restricted. Shortly, Roman children of the better class, from early childhood, wore a hollow golden ball (*aurea bullā*) suspended from the neck to prompt them to wisdom: offspring of freedmen and those of the poorer citizens, one of leather. Later, in Cicero's time, every child born of a free citizen had a gold *bullā*. It opened and within was an amulet against witchcraft, personal injury or death: indeed the Emperor Claudius had a knight, lucky in war, put to death to prove the charm of his *bullā* impotent. Worn until the Roman youth at seventeen assumed the *toga virilis*, the *bullā* was then hung up and dedicated to the household gods. Persius (34-62 A. D.) sings:*

*"When first, a timid youth, I knew the town,
Exchanged the purple for the virile gown,
The golden bulla from my neck unstrung,
The sacred bauble by the Lares hung,
From harsh restraint the first enlargement knew,
And crowds of parasites around me drew."*

* *The Knights*, lines 948-9, first produced in 424 B.C.

* *Satire XIII*, line 187.

* Plautus *Amphitryon*, Act II, Scene 2, lines 207-10.

* *Satire II*, lines 93-4.

* *Satire V*, lines 35-40.

A ROMAN BOOK ON PRECIOUS STONES

* Langhorne translation, 1835, p. 19.

A girl wore the *bullā* until her wedding day. Plutarch* states that Romulus decreed that the children of the Sabine women should be privileged to wear the *bullā*. The victorious Roman general, according to Macrobius, wore his *bullā* at his triumph, considering it a necessary ornament. It had within it "such remedies as they esteemed the most efficacious against the stroke of envy." The *bullā*, as an amulet, was worn largely as a protection against the "evil eye" (*fascinatio*), the fear of the Italian peasant of the present day. In instances, it was decorated with an emblem to avert this dread evil.

* George C. M. Birdwood, *The Industrial Arts of India*, Vol. II, p. 20.

The highborn Hindu boy has a similar hollow hemisphere of gold with about the same significance as the Roman *bullā*. *

It was also in the reign of Tarquinius Priscus, according to Florus that rings and the Roman regalia were introduced from Etruria.

The exact date when gold rings first appeared in Rome is not known but they were introduced, according to Pliny, from Greece. Livy (III) however, and likewise Dionysius of Halicarnassus, states that the Romans got their rings set with precious stones from the Sabines in the time of Romulus.

* Eutropius, *Abridgment of Roman History*, Bohn's Library, p. 471; *Florus*, Watson translation, Bohn's Library, p. 324; also Horace, Book IV, Ode 4.

The first gold rings were those given at public expense to Romans serving as ambassadors to foreign nations. The use of gold rings in Rome, however, was not common until the time of Gnaeus Flavius, about 315 B.C., and then only by Roman senators. By the time of the Second Punic War (219-202 B. C.) rings were in general use and those of the Roman upper classes were gold. After the battle of Cannae, Hannibal—having slain his Roman captives, knights, senators, and soldiers—sent three *modii* (about a bushel) of gold rings to Carthage.* Gaius Marius, however, wore an iron ring as late as his triumph over Jugurtha (104 B.C.) and only assumed the gold ring in his third consulate about 103 B.C. Tertullian (about 160-230 A.D.) states that a gold wedding ring was the only article of that metal worn by women in the olden time. At a much earlier day, however, when Rome took Veii

Roman Jewelry

(396 B.C.) the city of Rome, not being in a position to fulfill a vow made to the gods by its General Camillus, Roman women gave gold jewelry weighing eight *talents* (some 500 pounds) to make a crater* (jar).

Once a Roman wore but one ring and his wife probably none. Crassus (53 B.C.) was one of the first to wear two rings.* Horace considers it worthy of comment that Priscus, a dandy indeed, wore three rings, sometimes with his left hand bare* for those who overstepped the conventions of the day normally wore their rings on their left hands, so that their effeminate leanings might be relatively inconspicuous. Even in Horace's time, however, the equestrian gold ring was held in respect and a knight took it off before visiting his paramour.* By giving him the right to wear a gold ring, Julius Caesar raised Menas from a slave to a Roman knight.* The Emperor Augustus believed that Antonius Musa, a freedman, had cured him. He not only gave him wealth but permitted him to wear a gold ring, and not only him but "likewise to all those who did or should for the future follow the same profession."* To the slave, the possession of a gold ring meant manumission.*

In Pliny's time, rings were used in profusion, being valued for the beauty of their workmanship or for the gem set therein. In Martial's day* the social climber wore six rings on each finger and Martial suggests that an acquaintance wear his ring, so huge it was, on his leg rather than on his finger. The same poet* more gracefully adds regarding the poet Stella, "My friend Stella, Severus, wears on his fingers sardonyxes, emeralds, diamonds and jaspers. Though there are many gems on his fingers, there are more in his verses." Juvenal* tells of an upstart who, to protect his health, wore light rings in summer (and even under their light weight his fingers sweat) and heavy ones in winter. Lucian (120-180 A.D.), the Greek satirist, held that both Greeks and Romans in his time wore too many rings. In his satire, *The Cock*, he ridicules one of his characters who dreamed he had inherited sixteen rings, all of which he wore at the same time.

* *Plutarch's Lives*,
Wm. Mavor, New
York, 1835, p. 99.

* Isidorus, *Origines*
XIX, 32.

* *Satires*, Book II,
Satire VII, 8 f.

* *Satires*, Book II, No.
7.

* Dio Cassius, *History*
Abridged, by Xi-
phillin: Francis Man-
ning, translator, Lon-
don, 1704, Vol. I.

* *op. cit.*, Vol. I, p.
149

* Epictetus *Des.*, Book
IV, Ch. I.

* Book XI, Ch. 59.

* Book V, ep. 11 to
Severus.

* *Satire I*, line 26.

A ROMAN BOOK ON PRECIOUS STONES

* *Scriptores Historiae Augustae*, David Magie, Loeb Classics, Vol. II, p. 169.

In the later years of the Empire, the Romans had so many rings that Lampridius* says that the Emperor Heliogabalus would as soon have thought of wearing a shoe twice as a ring more than once. This degenerate even wore engraved gems on his shoes and his contemporaries hooted: "Could the artistic work of famous artists be seen as jewels attached to his feet." The Emperor Maximus was such a man that he wore his wife's bracelet as a thumb ring.

* *Training of an Orator*.

Attorneys and orators appear to have been particularly fond of, and dependent for, their success upon their rings, even if rented. Quintilian* (about 40-118 A.D.) bids the orator not to overload his fingers with rings nor should any of them come below the middle joint. His contemporary, Juvenal, states that a lawyer was judged by the magnificence of his attire, of which the aspiring young lawyer was aware.

* *Satire XII*, lines 203-4.

*"This Paulus saw, and soon with vast applause
In borrow'd robes and rings he pleads his cause."**

Again he philosophizes:

* *Satire VII*, lines 195-8.

*"Could Tully come to life would any now
Two hundred paltry sesterces (say \$10) bestow
For his advice, unless indeed he saw
A diamond glittering on the man of law."**

Persius (34-62 A.D.) states that orators love theatrical effects:

* *Satire I*, lines 27-30.

*"See at the desk the pale declaimer stand,
The ruby beaming on his lily hand;
Behind his back his wanton tresses flow:
With Tyrian dyes his splendid garments glow."**

* *Book XXXVII*, Ch. 23.

Pliny records that Polycrates (about 550 B.C.) had a sardonyx-set ring, and the Etruscans set stones in jewelry long before that. He adds that the first Roman to have a gem-set ring was the Elder Africanus (237-183 B.C.).* It is stated, however, that when the tomb of L. C. Scipio Barbatus, consul in 298 B.C., was opened, on one of his fingers was a ring set with sard, engraved with a winged victory holding a palm branch. Pope Pius VI gave the ring to the French antiquary Dutens and a century ago at least it was in the Northumberland Collection in Alnwick Castle.* From

* J. Lempriere enlarged by Chas. Anton. *Bibliotheca Classica*, New York, 1933, p. 270.

Roman Jewelry

the Elder Africanus' time, the use of engraved gems (intaglio) rapidly spread among the Romans, in part due to the fine sardonyxes and other quartz gems which had just become available in quantity from India. By the time of Julius Caesar, the use of engraved gems had become a passion, and the Roman general himself was known as an enthusiastic collector of gems.* Seneca tells of the fine gems studding his boots. Upon the conquest of King Mithridates by Pompey (66 B.C.), the use of pearls and precious stones became general and gem engraving flourished in Rome. Brilliant, fascinating stones were then available to the Romans, new species far surpassing the quartz gems, practically the only ones at the disposal of the earlier Romans. No wonder the most powerful and wealthiest people of the then Western World used gems without restraint, thus satisfying the vanity of a proud people. Rings set with two gems were called *annulus bigemmis*.

While we are on rings, we should mention the ring of Hannibal. His last troops defeated, he finally sought and found peace at the court of Prusias, King of Bithynia. The Romans demanded of Prusias his illustrious guest. The King dared not refuse, and the Carthaginian, in his sixty-third year—rather than fall into the hands of his implacable enemy—swallowed a dose of poison which, according to report, he constantly carried with him in the hollow of a ring.* In the reference mentioned, Juvenal says:

*"Nor swords, nor spears, nor stones from engines hurl'd
Shall quell the man whose form alarm'd the world,
The vengeance due to Cannae's fatal field,
And floods of human gore, a ring shall yield."*

This ring doubtless had a high pyramidal bezel, made hollow to hold the poison. Pliny himself says of the guardian officer of the temple treasury of Jupiter Capitolinus, knowing of irregularities as to the same in his regime, "being arrested, he broke the stone of his ring between his teeth and expired on the spot." Demosthenes also sought this way out of this world's woes.

Rings were likely to slip off the oil-anointed fingers

* Suetonius 47.

* Juvenal *Satire X*,
line 243, among
other authorities.

A ROMAN BOOK ON PRECIOUS STONES

of the Romans; hence Martial's epigram on a ring case: "but if you confide your jewel to me, it will be safe."*

* Book XIV, epigram 123.

While Roman women wore sumptuous earrings, most Romans did not wear them, although some fops, aping the Orientals, did.* Juvenal elsewhere describes an aggressive freedman at the palace pushing himself into line to receive a gift:

* Juvenal Book I, line 104.

*"Though born a slave ('tis bootless to deny
What these bored ears betray to every eye)."*

Later he had evidently become wealthy. The prejudice was due to the fact that among the Jews and certain other early peoples the earring was a sign of slavery. By ear boring, considered a blood sacrifice, the servant was bound over to his master.* The wearing of rings (finger, nose, and ear) sprang up after the Jews, under Moses, crossed the Red Sea.* One of the ten thousand was known by his fellow mercenaries to be a non-Greek "for Xenophon had noticed that he had his ears bored, like a Lydian." In the triumph of Marius (104 B.C.), Jugurtha, King of Numidia, was the principal exhibit. As the triumph ended, the Roman mob got out of hand and tore the King's gold rings from his ears, mutilating the lobes. Not only did the Carthaginians of position* wear earrings, but also the Arabs.* The Emperor Macrinus, being a native of Mauritania, per Dio Cassius, had an ear pierced after the fashion of the Moors.*

* Exodus 21:6 and Deuteronomy 15:17.

* Josephus *Antiquities*, Book III.

* Plautus, *Poenulus*, Act V, Scene 2.
* Petronius, *Satyricon*, Mitchell, translator, London, 1922, p. 152.

* op. cit., Vol. II, p. 34.

One of Cicero's most terse witticisms grew from the fact that while highborn Africans wore earrings, they were in many countries an emblem of slavery, as stated previously. Cicero and Octavius, an African, were involved in a trial and the latter complained that he could not hear Cicero. "That is something strange, for you are not without a hole in your ear," Cicero shot back. In Morocco, in our time, slaves wear earrings, their size indicating the importance of the position the slave has attained in his master's household.* It may be worth adding that the Tibetan of today believes that he whose ears are bored will be reincarnated in the next world as a donkey.

* C. E. Andrews, *Old Morocco and the Forbidden Atlas*, 1922, p. 151.

Roman Jewelry

Women in Pliny's time wore a wealth of jewelry (*ornamenta muliebria*), earrings (those with a single pendant were called *stalagmi*), diadems, fillets, necklaces (collars were called *monilia*), chains or strings of trinkets (*catellae*) and bead necklaces (*monilia baccatia*), intaglios and especially cameos as pendants, bracelets (*brachialis*) (that for the right wrist was *dextrocherium*) and armlets (*armillae*), also *torques* (from the Celtic torch or dorch), rings, pins for the hair, and even anklets (*periscelides*). While *armillae* were worn by the Medes, Persians, and Gauls, Roman men who wore them were considered either effeminate or vulgarly ostentatious parvenus. Pliny becomes weary merely from enumerating the trinkets women wear, and he marvels that women survive their weight. Necklaces started as a single strand but later two or three strands were common. After Pompey's conquests, precious stones were commonly mounted in them. Amber necklaces were popular, not only for their beauty, but also for their supposed medicinal virtues. It may be remarked that when Antony in 43 B.C. placed the head and hand of Cicero on the *Rostra*, Fulvia, Clodius' widow, spat in the dead man's face and pierced with a pin she wore in her hair that tongue which had so lashed her husband.

Claudian (4th century A.D.) thus describes a bride's jewelry:*

*"A verdant jasper (she) places on her breast
With costly gems the flowing hair confines;
A precious collar round the neck entwines;
And to the ears, delightful pearl, suspends,
That elegance to the features, lends."*

The groom gave his bride a ring to be worn on the fourth finger of her left hand and other jewelry later.

Terence (190-159 B.C.) gives us this choice morsel: "We found her dressed without gold or trinkets, as ladies who are dressed only for themselves." At least, in those times a man amounted to something! When Romans of class dined alone, the wife was like some wives today, without gold ornaments.* Plutarch adds,

* Panegyric to 6th
Consulate of Hon-
orius.

* Plutarch, *Miscellaneous and Essays*, Wm. W. Goodwin, Boston, 1888, Vol. II, p. 305, 497.

A ROMAN BOOK ON PRECIOUS STONES

however, that the Egyptian women wore no shoes to keep them at home. Roman women, on the other hand, "unless allowed their jewels, their bracelets, and their necklaces," will never stir abroad. Terence states that Greek women during mourning wore no trinkets.* Juvenal in his *Satires* pays several doubtful tributes to women's love of jewelry, as:

* *The Self Tormentor*.

*"Marry and be discreet, and many a ring,
And many a gem shall well-judged silence bring."**

* *Satire II*, lines 83-4.

Again:

*"Thither each year impatiently she (the favorite for the time)
hies (to the Fifth Avenue Jeweler of the time)
And Myrrhine vase or costly crystal brings;
One gem is there whose scintillating light,
Too strong temptation! captivates her sight.
The same, (they tell her) the authentic stone,
That once on Berenice's finger shone,
The pledge which on a guilty sister's hand
Agrippa placed."**

* *Satire VI*, lines 193-200.

Again, speaking of an indulged wife:

*"Ears deck'd with emeralds, arms with bracelets bound,
Denotes a tribe that nothing can confound:
Of all life's various curses few so great
As women's darings, backed by large estate."**

* *Satire VI*, lines 563-6.

Terence (190-159 B.C.) in his best known work, *The Self Tormentor*, describes Bacchis, Clipithos' lady love, an expensive Athenian week-end guest:

*"First, she's brought with her half a score of maids,
Tricked out the jades with gold and jewelry;
Why if her lover were an Eastern prince
He couldn't stand it—how on earth can you?"*

* J. M. Mitchell,
translator, London,
1922.

Petronius, once Nero's favorite, in his *Satyricon** has Scintilla say regarding her striking earrings, "My husband is such a generous man, no one has a finer pair."

"What?" cried Habinnas, "It's drained me dry to get you those wretched glass kickshaws. I tell you, if I had a daughter, I'd amputate her ears. If there were no women everything would be dirt-cheap."

* *Epist. V*, 16.

Pliny the Younger* in the touching letter telling of the death of Fundanus' young daughter, betrothed to

Roman Jewelry

a noble Roman youth, states that on her death Fundanus gave orders that "that which he had meant to lay out on dresses and pearls and jewels should be spent on incense, unguents, and spices." Terence confirms that the Roman father indulgently gave his daughter jewelry before her wedding.* So jewels featured Roman weddings, as they do our own.

The excessive use of jewels in his time raised Pliny's ire. In an earlier and happier day it was different: the Carthaginian ambassadors, with amused contempt, had found that the whole Roman Senate possessed but one service of silver plate, which was used at each and every dinner tendered the envoys. Pliny's darts are aimed at the women who bedizen themselves, and even their sandals,* with jewels and sleep with sachets filled with pearls around their necks, attempting to establish an "equestrian order of females":* at the sums spent by women on their earrings:* then to men who "search amid the regions of the clouds for vessels (crystal) with which to cool our draughts and to excavate rocks, towering to the very heavens, in order that we may have the satisfaction of drinking from ice":* at the likeness of Pompey in pearls:* discouraged, he doubts the right "to censure the employment of drinking cups adorned with precious stones"; perhaps a broken *murrhine* cup should be exhibited with the same sorrow as the body of a leading citizen:* and perhaps a small amber figurine should sell for more than a husky slave.* He is, however, shocked that Lollia Paulina, the wife of the Emperor Caligula, wore at a wedding party emeralds and pearls worth \$1,700,000.

Pliny was not alone in his opinion. Seneca* says "that woman in her madness deems that her husband would not be sufficiently tormented if she did not wear in each ear the value of three fortunes" and he is distressed that the Romans wear a jewel on each finger joint and by their excessive extravagance in the use of crystal and agate cups. Horace* claims that poverty is preferable to great riches. "Let us then cast our gems and precious stones and useless gold, the cause of extreme evil, into the Capitol (i.e., as a votive offering)

* *The Self Tormentor.*

* Book IX, Ch. 56.

* Book XXXIII, Ch. 12.

* Book XI, Ch. 37.

* Book XXXVI.

* Ch. 6.

* Ch. 7.

* Ch. 12.

* *De Benef 7.*

* Book III, *Ode XXIV to the Covetous.*

A ROMAN BOOK ON PRECIOUS STONES

* II, IV, lines 26-40,
translation by J. P.
Postgate, Loeb
Classical Library,
London, 1931.

* Tacitus *Annals* 3.53;
G. Ferrero, *The
Women of the Caes-
ars*, 1925, p. 172; Dio
Cassius LVII 15.

* Ch. 3, vv. 16-24.

* 1st book *Padag.*
Ch. 10.

whither the acclamations and crowd of applauding citizens calls us, or into the adjoining ocean." Albius Tibullus* (died 19 B. C.) calls ruin upon the dealer in the green emerald (*smaragdus*) and the pearl, for these make women covetous. "From this comes the noise of weeping and of bickering. This, in brief, is the cause that Love now roams the earth dishonored." Tiberius in 22 A.D. wrote a letter to the Senate deploring the passion many women, and women only, had for precious stones, thereby draining the empire of gold which could much better be used to fortify the frontiers.* Tertullian (about 160-230 A. D.) reproaches the women of his time for wearing "on every finger of their left hand a patrimony." He exhorted Christian women against wearing such marks of "lasciviousness" and asked them to be content with the single betrothal ring of their ancestors.

That it was not alone Greek and Roman leaders who harangued against the wealth of jewels indulged in by women we know from the remarks of the Prophet Isaiah in the 8th century, B.C. He* deplores the overindulgence in jewels by the Jewish women of his time; as they are "haughty and walk with stretched forth necks and wanton eyes, walking and mincing as they go, and making a tinkling with their feet," they are to be punished. "In that day the Lord will take away the bravery of their tinkling ornaments about their feet and their cauls and their round tires like the moon, the chains and the bracelets, and the mufflers, and the bonnets and the ornaments of the legs, and the headbands, the tablets, and the earrings, the rings and nose jewels." St. Paul and Petronius railed against the display of jewels, the vulgar display of Indian gems particularly irking the latter. St. Jerome and Dion of the Golden Mouth, in the 4th century of our era, satirize the vanities of Christian women who wear jewelry and use powder, paint, and perfumes. Clement of Alexandria* and Cyprian express similar views.

Jovinian, a monk of the 4th century of our era, advised the wise man not to marry since when a wife's "many needs—precious robes, gold and gems" are ful-

Roman Jewelry

filled, she complains that other women are better garbed and "I, poor wretch, must hang my head down among my fellows."

Pliny's statement, regarding Pompey's portrait in pearls that the Roman laws would not permit him to wear, suggests that there were at one time sumptuary laws in Rome against wearing pearls. Sumptuary laws began with the ancient Greeks; under Lycurgus, the use of gold and silver was prohibited, these metals being considered the origin of all evil. Somewhat later Solon forbade the gem engraver to keep the impressions of gems he had sold,* and Solonian laws were passed against costly feminine apparel and ornaments, particularly those of the bride's dowry.

At Rome, Numa prohibited representation of gods on Roman seal rings. The Twelve Tables (451-449 B.C.) forbade that gold be buried with the dead "But if the teeth of the deceased are fastened with gold, let none be prosecuted for burying or burning the deceased with that gold."* To increase the gold and silver reserves of the state treasury, the use of jewelry and silverplate was restricted during the Punic War and indeed, according to the Lex Oppia (215 B.C.) women were forbidden to wear in ornaments more than half an ounce of gold. This war measure was, however, repealed in 195 B. C. in which year the women (an early political pressure group) rushed to the Forum and with threats compelled the senators to change the law. It is, however, pleasant to record that in 210 B.C., when Hannibal was pressing Rome hard, the Consul, Laevinus, in the Senate protested against the severity and inequality of the taxes passed to finance the war. He urged that each senator, as a patriotic duty, loan to the state all the gold, silver, and jewelry he possessed except a minimum for his wife, his son, his daughter, and his table. The suggestion was received with enthusiasm and when the Senate adjourned that day the Forum swarmed with the rich, their slaves carrying precious burdens, thank offerings to their fatherland. The example was infectious and was followed by every class, so that the clerks could not make a complete register of the names

* Diogenes Laertius I, II, IX.

* G. W. Botsford, *A History of the Ancient World*, New York, 1917, p. 344.

of the givers. The State benefited more than it could have from any possible taxation and every citizen was filled with satisfaction at the fulfillment of his civic duty. These loans were repaid six years later at the suggestion of Laevinus. Cato the Censor (185 B.C.) revived the earlier laws and several leading nobles were forced out of the Senate, being charged with illegally wearing jewelry or of using silverware on their tables. Cato specified the metal of which a citizen's ring—according to his station—should be made, nor could senators wear their gold rings in private life, the rings being lodged in the treasury and only issued to those on embassies. Women's ornaments exceeding 1500 *denarii* (say, \$250) were for purpose of taxation assessed ten times their value.

Julius Caesar (*Leges Juliae*) only permitted jewels to be worn by persons of a certain rank and age and then only on certain days. Unmarried women could not wear precious stones but to encourage, in his dissolute time, the sanctity of marriage, he permitted matrons to wear more ornaments than the Roman sumptuary laws allowed other women. Among the famous social laws of Augustus (about 18 B.C.) was the Lex Sumptuaria prohibiting women from spending too much of the family fortune on jewels.* Tiberius (16 A.D.) passed a law that permitted patricians descended from two generations of freedmen to wear gold rings. Other freedmen were permitted to wear silver rings, while slaves could wear only iron rings although *sub rosa* they sometimes gilded them. Other ornaments of gold could only be worn by men at religious ceremonies. Justinian (483-565 A.D.) granted all Roman citizens the right to wear gold rings. Hadrian, Alexander Severus (he forbade men to wear earrings)* and Aurelian all attempted to restrain excesses in luxuries but, like most sumptuary laws, these failed. Emperor Leo in the 5th century A.D. was the last Roman emperor to father a sumptuary law. Pearls, emeralds, and sapphires were not to be used on horse trappings and men could not set precious stones on the clasps of their tunics.

* G. Ferrero, *The Women of Caesars*, p. 69.

* Lamprid, *Vita*.

Roman Jewelers and Lapidaries

CHAPTER V

IN Pliny's time, the jewelry trade was a thoroughly integrated industry, including traders, explorers like the equestrian sent northward in search of amber—the Jean Baptiste Tavernier of his time, brokers in precious stones, makers of false stones, lapidaries and gem engravers, setters, goldsmiths, silversmiths, and retail merchants.

In the Chou period (1000 B.C.), the Chinese nobles despised trade and regarded merchants with contempt. The Greeks also disdained the tradesman, holding that haggling over profits made poor citizens. Cato (234-149 B.C.), the Roman patriot, in the introduction to his treatise on agriculture,* states that farming “makes the bravest men and the sturdiest soldiers.” Trade may be more profitable than farming, but it is much more hazardous. However, “I . . . think well of a merchant as a man of energy and studious of gain: but it is a career that leads to danger and ruin.” Cicero* says of tradesmen “they make no profit except by a certain amount of falsehood” although business on a large scale, provided it was honorably conducted, “is not so very discreditable” especially if after he has made his fortune the merchant retires and becomes a gentleman farmer. In the time of Augustus, similarly, the merchant, particularly the retailer, was held more or less in contempt by the Romans. In consequence, many of the merchants in Pliny's time were not Romans but Greeks, and in his opinion also merchandising, the invention of the Phoenicians, was much less respectable than agriculture. Indeed, in his day, farming was the only respectable business.

* *Agri Cultura*

* *De Officiis*, Book I, 52.

A ROMAN BOOK ON PRECIOUS STONES

Dionysius Periegetes, of about Pliny's time, in his geographical poem, in which we find many references to gem occurrences, states that he is no merchant nor has he sailed the Indian Ocean "like the many who stake their lives for vast wealth."

Saint John Chrysostom (347-407 A.D.) expressed himself as follows: "Whoever buys a thing in order to make a profit selling it, whole and unchanged, is the trader who is cast out of God's Temple." In the 14th century the merchant was scarcely to be distinguished from the pirate. Nietzsche (1844-1900 A.D.) says his morality was merely the refinement of that of a pirate.

Pliny, as we have said, did not highly regard those of the jewelry trade, and he evidently considered them a tricky crew. He emphasized their unwillingness to permit their clients to satisfy themselves of the genuineness of the wares offered. We, further, find the morals of the trade not high, for in the reign of that pervert Heliogabalus, Valerianus Vetus was executed for having designed and made small gold images, worn as ornaments by the ladies of pleasure.* But there were exceptions for, dating from the days of Julius Caesar, there is an epitaph of a jeweler on the Via Sacra, perhaps written by relatives, which concludes: "He was compassionate and loved the poor,"* an eulogy many of us might covet.

Most authorities ascribe the motive of Lucius Piso, Governor of Further Spain, as recounted by Cicero, to his desire to be above all suspicion of dishonesty. I am rather inclined to ascribe it to his lack of faith in the uprightness of the artisan concerned. In going through his military exercises, he broke his ring—it probably being hollow and of fine, hence soft, gold. The governor summoned a goldsmith to his tribunal in the open forum of Corduba (Cordova), gave him the ring, weighed out the extra gold required for the job, and had the ring repaired in full view of the local populace. In Plutarch's *Essay*,* he speaks of "the impertinent labor of the goldsmith." In the *Menaechmi*,* a comedy by Plautus (died 184 B.C.), one of the women asks that her bracelet be taken to the goldsmith's, that an

* Dio Cassius, *History*,
Translator, Francis
Manning, London,
1704, Vol. II, p. 354.

* Corp. insc. Lat. I,
1027.

* *The Love of Wealth*,
Miscellaneous Essays,
Wm. W. Goodwin,
Boston, 1888, Vol. II,
p. 303.

* Act III, Scene III.

ounce of gold be added to it, and that it be fashioned anew. Today, the wealthy Hindu, to protect himself, follows the procedure of Piso, for in India, likewise, the goldsmith is held in little esteem.

Theophrastus, writing about 315 B.C., mentions those stones which are cut as gems, some being so hard they cannot be cut with iron "but only by other stones." Some sort of a lathe was even then used by lapidaries, as certain of the gems of that time have been shaped by the turner's instruments. The carbuncle, emerald, and other stones, notably the stone from "the gold mines of Lampsacus used as a seal by the King" (of Persia) were engraved as signets. Cutting the *lapis lyncurius* (tourmaline?) was difficult and workmanship was needed to bring out the luster of the emerald "for originally it is not so bright."

As to the cutting of gems, Pliny states that cut stones with a smooth level surface are preferred to those which exhibit depressions or other irregularities. An oblong shape is best; next to it, the lenticular; after this, circular stones are admired, those which are irregularly angular being held in the least esteem. In explanation, flat stones were preferred to those capable of being cut only cabochon, as the former were suitable for engraving. The oblong had evidently supplanted the ancient lenticular form while the angular was perhaps only used when to cut the rough gem in one of the more desired forms would drastically reduce the weight of a stone. The only stone Pliny mentions as faceted was the beryl (and its variety emerald) and this only by polishing the six faces of the natural prism; a method believed to be the best to increase the stone's brilliancy.* The Hindus, in Pliny's time, preferred long hexagonal beryl beads and these, pierced, were strung on elephant's hair, it being the only stone they wore without gold setting. The piercing evidently improved the color and transparency of some beryls although the finest were not pierced but were held in place by studs of gold attached to the ends. Beads of plasma and garnet also cut into prisms are from time to time found in Roman ruins, so abundantly indeed that **graded neck-**

* Ch. 20.

A ROMAN BOOK ON PRECIOUS STONES

* C. W. King, *Antique Gems*, London, 1860, p. 15.

* Ch. 23.

* Ch. 30.

* Ch. 33.

* Ch. 32.

laces can be made from them. These presumably post-date Pliny's time.* The sardonyx was also pierced and worn in neck ornaments by the poorer people of India.* In Pliny's time, the presence of a hole pierced in the stone proved it of Indian origin, an indication still in instances used by precious stone dealers. The lapidaries of the day hollowed out the lower side of garnets of deep color to give them a lighter and more pleasing hue. While shaped into cups, garnet "offers the most obstinate resistance to the graver."* Other stones were more easily cut, that of the *callaina* (turquoise)* being "easily done." *Topazos* (peridot) is the "only stone of high value that yields to the action of the file, the rest being polished by the aid of the stone of Naxos" (emery). Peridot "wears with use,"* its softness being the reason why we today rarely set it in rings. Unusually perfect rock crystals called *aconteta* (without flaw) were set uncut in jewelry.

Pliny states that the skilled artisan can hide the imperfections of rock crystal by cutting and engraving the stone. Tavernier, sixteen hundred years later, warned merchants to examine, with particular care, Indian diamonds with many facets, for the Hindu diamond cutter hid flaws with facets.

The garnets found on the hill of Orthosia in Asia Minor were cut "to perfection by the Alabandians" in the nearby city of Alabanda. The early existence of this cutting center, exclusively for colored stones, is interesting.

Softer stones were shaped by a file but emery was used to cut and polish most gems.* The emerald and the sapphire were rarely engraved and, as to the latter, the lapidary usually only polished the surface of the original pebble.

* Book XXXVI, Ch. 10, and Book XXXVII, Ch. 32.

* Ch. 4.

* Ch. 4.

Pliny* lists as famous engravers Pyrgoteles, Apollonides, Cronius, and Dioscurides, all Greeks. Alexander the Great permitted Pyrgoteles alone to engrave his likeness.* Dioscurides cut a signet with an excellent likeness of Emperor Augustus, a seal thereafter used officially by the Roman Emperors. Gem engraving reached its height under Augustus and continued on a

Roman Jewelers and Lapidaries

high plane until the time of Hadrian when it began to deteriorate. Indeed, in general, the decline of classical art appears to have been more or less continuous from about 400 B.C. to 200 A.D.

Seneca* is the first Roman to speak of cameos (to be specific, a ring set with the head of Tiberius in relief), intaglios having preceded them by thousands of years. A few cameos, however, were cut in Greece and in Etruria early in the 5th century B.C., but cameos only became relatively common a couple of centuries later when Indian layered stones were available to the Greek lapidaries. The Babylonians, centuries before, had rather crudely cut a few poor cameos.* In Rome, cameos which could only be used ornamentally, were never as popular as intaglios which were not only beautiful but also had their practical use as signets.

Among the engravers' tools were diamond splinters, set in iron, capable of cutting the hardest substances known:* for softer stones emery or merely an iron point were used by engravers.* The gem engraver also used the *lima* (or file) and in the bronze statue which Theodorus of Samos, architect, sculptor, and gem engraver, cast of himself, he holds a file in his right hand.* He was one of the earliest gem engravers known, being mentioned by Herodotus.* The file consisted of a mixture of emery and melted resin.* Appuleius* says that Hippias, the philosopher, used one in engraving the gem set in a ring which he fabricated for himself. Maecenas in a letter to Horace also mentions the *lima*. This is the forerunner of the diamond impregnated wheels and tools of today. The lapidary's wheel with its accompanying drills was used by the Mesopotamian lapidaries in the 4th millenium before Christ and reached Europe between 1800 and 1600 B.C. (Minoan III period). The gravestone of a gem cutter found at Philadelphia, Asia Minor, in a broad way a contemporary of Pliny, shows what appears to be a bow drill. Doubtless some of the diamond splinters set in iron were used as tools in such drills. A Greek gem of the 5th century B.C., now in the British

* *De Beneficiis* III, 26, written about 62 A.D.

* *A Hist. of Art in Chaldea and Assyria*, G. Perrot and Chas. Chipez, New York, 1884, Vol. II, p. 280.

* Ch. 15.

* Ch. 76.

* Book XXXIV, Ch. 19.

* Book III, Ch. 41.

* Horace, *Anth. Lat. I*, p. 4130.

* *Florida*, Book II.

Museum, also shows drilling. The Greek name for this type of artist, *dacyloiloglyphos*, is most descriptive, "he whose fingers hollow out the stone." The Roman lapidary also used a saw (*serra*) consisting of a wire drawn back and forth, fed with a powdered abrasive. The *ostracias* (perhaps flint)* was also used to engrave gems. Whether the gem engraver used a magnifying glass is a moot question.

At first the worker in gold was called *aurarius*, later *aurifex*, and the retailer of rings, *anularii*.

As to the setting of gems, Pliny says little. The beauty of the turquoise is, however, heightened by setting in gold, the contrast of the stone and the gold being admirable:* a statement true today. The *chrysolithos* (topaz) if fine was set *a jour* in an open bezel, if of inferior quality its color was heightened by a foil of *aurichalcium* (a copper compound).* The beauty of *sarda* (our carnelian) was, in some instances, increased by the use of silver foil and in others of gold.* The art of the use of foils is an old one. The Minoans (2000-1600 B.C.) made a gaming table decorated with strips and discs of rich crystal. The latter was alternately backed by silver plaques and blue vitreous paste (*cyanos*).

The Roman private banker, like the bankers of the Middle Ages, traded in precious metals and stones and usually also performed the functions of a dealer in gold and silverware.* The Roman merchant was a greater traveler than his American confrere, a personal interview being required in many instances in which today a letter, a telephone call, a telegram, or a radio message suffices.

Like the people of the East, each trade in Rome tended to have its quarters. In 211 B.C., Hannibal was much annoyed when he pitched his camp on the Anio and found that in Rome the very land on which his tent was standing had since then been sold in Rome, with no reduction in price, so Livy tells us. Being at the city walls, he was so confident of the city's fall that "in pique he bade an auctioneer put up the silversmith's shops in the Forum for sale." The finest jewelry shops

* Ch. 65.

* Ch. 33.

* Ch. 42.

* Ch. 31.

* Wm. Stearns Davis, *Influence of Wealth in Imperial Rome*, New York, 1913, p. 75.

Roman Jewelers and Lapidaries

in Pliny's time were in the great market buildings by the Saepta Julia on the Campus Martius,* on the Porticus Argonautorum,* and the Via Sacra.* On these Fifth Avenues of ancient Rome, one could purchase crystal cups, agate vases, and jewelry of every sort. We obtain an idea of the shops themselves from Martial,* who describes Mamurra, a fourflusher, on a shopping tour in Rome. He examined everything. Next, complaining that some crystal vases had been spoiled by an admixture of glass, he selected and set aside ten *murrhine* cups . . . He counted emeralds set in chased gold, and examined the largest pearl ear pendants. He sought on every counter for real sardonyxes and cheapened some large jaspers. At last when forced by fatigue to retire at the eleventh hour, he bought two cups for one small coin and carried them home himself. Many inscriptions have been found on the Via Sacra relating to tradesmen in luxuries, particularly jewelers. While the jewelers, engravers of gems, and lapidaries had workshops on the Via Sacra, much jewelry was imported from Asia Minor and from Alexandria, Egypt,* while at least some of the cups of precious stones were cut in the East. Certain provincial towns were noted for their precious wares, Aquileia, for example, for its amber objets d' art, its silverware, and its gold jewelry. Some twenty years ago there was excavated in the Via dell' Abbondanza, Pompeii, the house of one Cerialis, a jeweler of Pliny's time. In his flight from the terrors of the eruption he doubtless took with him his finest gems but a number of precious stones and some tools were left behind in his shop. In the dining room of the house of the Vettii in Pompeii is a most amusing mural depicting all phases of the jewelry trade. The proprietor, the artisans, and the *grande dame* client are all cherubs, entrancingly chubby, their absurdly small wings apparently too short for long distance flight.*

Both the gem trade and the jewelry industry were made up of many small units producing, in most instances at least, individual orders. Mass production did not exist, the piece of jewelry being made and sold in

* Davis op. cit.
pp. 121-3. Mart. IX,
59; X, 80.

* Juv. VI, 153-7.

* Among others, Propertius (59 B.C.) *Defense of Inconstancy*.

* Book IX, Ep. 59.

* E. H. Warmington,
*Commerce between the
Roman Empire and
India*, pp. 303-4.

* August Mau, *Pompeii*.
Translated by Francis
W. Kelsey, New York,
1899, p. 328.

A ROMAN BOOK ON PRECIOUS STONES

the same shop. The customer might well furnish his gold and even his unset gems. Indeed, the client furnished the gold in Aristophanes' time.* Various lawsuits, however, show that some jewelers carried considerable stocks of gold and precious stones: some were men of wealth and from their tombstones we know they left large legacies and had many freedmen who served them. Of one such freedman, Canuleius Zosimus, his patron, who erected the tablet, says: "He has never spoken evil of anyone and he did nothing contrary to the wishes of his patron. Though he always had much gold and silver in his possession, he coveted none of it. He excelled in carving Clodian ware."* A retail jeweler laments the death of this 13-year slave and in his epitaph he states:

*"Skilled was his hand in the art of finishing necklaces finely,
And to enclose in handwrought gold, bright glittering jewels."**

The tomb of Evodus, a pearl merchant (*margarius*) can be seen today on the Via Sacra. Most of the merchants were humble folk, but the epitaph of a woman dealing in pearls on the Via Sacra "had freedmen and freedwomen of her own," for whom she provided a last resting place beside herself.*

Many of the gem engravers and lapidaries in Rome particularly after the reign of Augustus were of Greek origin, and frequently slaves. That the so-called Roman engraved gems were in many instances cut by Greek artists is indicated by the frequent use of Greek gods as subjects and the Grecian grouping presented. When the art passed largely into Roman hands, mere size was confused with beauty. Many wealthy Romans of the Late Empire had slave engravers in their homes. Further, it was not infrequent for a patron as a business venture to set up a skilled slave or freedman in the jewelry trade. However, slaves, in instances, saved enough to buy their freedom and as freedmen to finance their own shop. A Roman inscription at Malton, Yorkshire, England, mentions a goldsmith's shop run by a slave, adding "good luck to you slave in running this shop."*

Gem engravers (*gemmarii*) cut either intaglios or cameos. The cutters of cameos were called *caelatores* or

* *Plutus*, line 165.

* Tenny Frank, *Economic History of Rome*, Baltimore, pp. 187-8.

* Friedlander, *Roman Life, etc.* Translated by Leonard A. Mag-nus, undated, probably about 1900, p. 153.

* Or. Henz. 4148.

* Tenny Frank, *An Economic Survey of Rome*, Baltimore, 1933, Vol. III, p. 99; also Thomas Wright, *The Celt, the Roman and the Saxon*, pp. 251-2.

Roman Jewelers and Lapidaries

scalptores; while the artisans who fashioned the intaglios were known as *cavatores* or *signarii*. Lapidaries also cut cabochon stones and beads and polished smooth the natural faces of beryls and emeralds. Others fabricated false stones, some producing extraordinarily good imitations of certain gems. Each branch of the trade was handled by a specialist and Saint Augustine (354-430 A.D.) compared the lesser gods with their circumscribed power with the craftsmen in the Streets of the Silversmiths, where each article passed through many hands, the mastery of the whole difficult to learn—that of the part, easy.

Guilds of artisans in the same trade must have originated in very early times (Babylonia long previous to 1900 B.C. had had guilds) and they had some of the characteristics of our own labor unions; for example, Demetrius* was perhaps the union leader of the guild of silversmiths in Ephesus. One of the oldest *Collegia* in Rome was that of the goldsmiths which is said to have existed in the time of Numa (715-673 B.C.). Plutarch* tells us that each guild had its own hall, its court, and its religious rituals peculiar to itself. By 150 A.D. the guilds of the gold and silversmiths and of the salt miners were among the strongest in Rome.* Caesar Augustus' father was a silversmith.* The silversmiths of Rome, as a body, erected (204 A.D.) a small triumphal arch in honor of Septimus Severus and his family in the *velabrum* or cattle market where their shops were. Monsignor X Barbier du Montault* gives an epitaph of a goldsmith who belonged to the guild in the time of Marcus Aurelius. In addition to the gold- and silversmiths' guilds there were ringmakers', gold-beaters', and gilders' guilds.

These Latin guilds, like some of their successors of today, were politically minded. Scrawled on the walls of Pompeii we find, among other political propaganda, the following: "All goldsmiths recommend Gaius Cuspis Pausa for the aedileship."*

In India, guilds are an ancient hereditary institution. The *Ramayana* or *Ayodhya-Kanda* describes a procession of trade guilds, jewelers, potters, ivory workers,

* Acts 19: 24-41.

* *Lives*, Wm. Mavor, New York, 1835, p. 49.

* Davis, *The Influence of Wealth in Imperial Rome*, pp. 230-2.

* C. Suetonius Tranquillus, *The Lives of the Twelve Caesars*, Alex Thomson, New York, 1893, p. 123.

* *Revue de l'Art Chretien*, Tome VI, 2 livraison, 1889, p. 1.

* August Mau, *Pompeii*. Translated by Francis W. Kelsey, New York, 1899, p. 376.

A ROMAN BOOK ON PRECIOUS STONES

perfumers, goldsmiths, and cutters of crystal. Among the Jews, unions did not exist before the Babylonian captivity. Some centuries later each guild had its appointed place and all members of the guild sat together in the huge synagogue at Alexandria, Egypt. The Egyptian goldsmiths in Christ's time had their guilds.*

We must add a link with today, our friend the pawnbroker. Menander, an early writer of comedies (born 342 B.C.) in his *Arbitration*, referring to the ring of one of his characters, states: "Or he may have been at dice and put the ring up as a stake: or perhaps He owed some debt and had no cash, and so Paid with the ring. Hundreds of things like that Happen at drinking bouts."* Martial (86 A.D.) describes a young Roman blade, faultlessly attired, seated in his sedan chair and accompanied by clerks and pages, who had "just pledged a ring at Claudius, the usurer's for eight *sestertii* to pay for his supper." Juvenal* describes the spendthrift who, having used up his patrimony, has only his ring left:

*"At length when nought remains a meal to bring,
The last poor shift, off comes the knightly ring."*

Others pawned their plate.* In Ptolemaic time in Egypt an unfortunate importunes his friend, "Now please redeem my property from Sarapion. It is pledged for two minae." After stating that the interest is partly paid, he lists the property pawned. Two bracelets were also pawned with another pawnbroker, one Onetor.*

Trogus Pompeius states that his father in the time of Julius Caesar had as keeper of his cabinet of jewels (*libertus a dactyliotheca Caesaris*) one Julius Philargyrus. Hadrian also placed his large and valuable collection of jewels in charge of a *dactyliotheca Caesaris*; this collection was later sold by Marcus Aurelius (121-180 A.D.) at public auction to more than successfully defray the cost of the war with the Marcomanni. Nor were gem collections confined to royalty as those of Maecenas and others show. Indeed as a patron of gem engravers and lovers, Maecenas was the Lorenzo de Medici of his time. The rich had a slave to see that the banquet guests did not pry the gems from the gold

* Tenny Frank, *An Economic Survey of Rome*, Baltimore, 1933, Vol. II.

* *Two Plays of Menander*, Gilbert Murray, New York, p. 174.

* *Satire VI*, lines 55-6.

* *Satire X*, lines 17-18.

* Maspero, *History of Egypt*, Vol. XII, by L. W. King and H. R. Hill, p. 443.

Roman Jewelers and Lapidaries

drinking cups which were used only on ceremonial occasions. All the emperors from Augustus to the later emperors and, we may add, their wives, had goldsmiths attached to their household staffs.

Geographical Sources of Gems

CHAPTER VI

HE gems used in Pliny's time were poorer in quality than those of today. Jewelry of the classical period is, nevertheless, beautiful, thanks to the artistic cunning of the goldsmith, the unsurpassed skill of the gem engraver, and the unequalled color consciousness of the jeweler.

In Pliny's day the lesser gems were relatively more important than they are today. On the one hand, many of the localities producing the finer lesser gems were known in his day, while the Roman knew few of the more important sources of the noble gems. Pliny looked for his emeralds to the East and to Egypt, producers of poor stones compared to the gorgeous ones from Colombia, and for his rubies and sapphires to India and probably to Ceylon,* stones on the average insipid in color compared to the strongly colored corundum gems of Burma, Kashmir, and Siam. As for the larger and better diamonds of India, as fine stones as ever existed, few of these were then produced, and certainly at least not in quantity and few were exported to Rome in the 1st century of our era. Further, at that time commerce of the lesser gems was more highly developed than that of the noble gems, and the former fitted better the purse of the average Roman citizen of that period. Pliny's contemporaries had as fine peridots, garnets, sardonyxes, carnelians, and lapis lazuli as we possess and presumably as fine turquoise. Most of their other gems were inferior to our own.

The ancients obtained their gemstones from four sources: gem deposits still known to us and in some

* Book VI, Ch. 24.

Geographical Sources of Gems

instances still being operated (Baltic amber, for example); gem deposits worked by them and since exhausted (the carnelian locality near Babylon described by older writers was exhausted even in Pliny's day); gem deposits known to them but with which we are unacquainted; and gem deposits producing too poor a product to be operated today.

In Pliny's time the Roman Empire included the Mediterranean basin, a region poor in fine gems; indeed within it there is no gem deposit of the first magnitude. It furnished, however, mediocre emeralds, fine peridots, a reasonable amount of quartz and other of the less valuable gems of good quality, and a wide variety of gem minerals of relatively poor quality. The Roman was forced to seek finer gems beyond the boundaries of his empire. Indeed, Rome's foreign commerce was in luxuries, as her own provinces furnished only the necessities of life. The Roman sent expeditions to the Baltic to bring back amber, and mined jet and fluorspar in Britain. Further, from India, Ceylon, Persia, Afghanistan, and the shores of the Red Sea, precious stones trickled into Rome through long-established trade channels. Propertius, in his *Venal Infidelity*, says of his unfaithful mistress:

*"For gifts, oh Jupiter! she pines in love.
For lucid gems she sends me o'er the main,
And bids me seek in Tyre the purple grain."*

Pliny gives the source of many of the precious stones he describes. To him "the fabulous region of India is the sole parent" of the opal, "thus completing her glory as being the great producer of the most costly gems."* Herodotus (born 484 B.C.), however, apparently did not know that the noble gems (if they existed in Greece in his time)—the diamond, ruby, and sapphire—came from India and contiguous parts. He probably never had seen a diamond, and this notwithstanding the fact that he traveled widely in Persia—then in commercial contact with India. In that day, the few fine stones produced in India were doubtless claimed as regal right and hoarded by the local potentates. Asia's riches commercially, however, were recognized early, for Cicero

* Book XXXVI, Ch. 21;
also Book XXXVII.

A ROMAN BOOK ON PRECIOUS STONES

(106-43 B.C.) says: "Asia is so rich and fertile that the fecundity of its plains, the variety of its products, the extent of its pastures, the multiplicity of the objects of commerce exported from it give it an incontestable superiority over all other countries of the earth."* Ovid (43 B.C.-17 A.D.) mentions as set in Roman jewelry "stones procured in the East."* Albius Tibullus,* who died in 19 B.C., mentions the gems "which grow in India." Propertius (50-15 B.C.)* tells of "stones of Eastern Climes" and of "Indian gems";* and of course Claudian knew of Indian stones, but he did not live till the 4th century of our era. As to India's riches in precious stones, Dionysius Periegetes (probably time of Augustus or at latest that of Trajan, hence more or less a contemporary of Pliny) sings:

*"Many (Indians) retire to rivers shoal, and plunge
To seek the beryl flaming in its bed,
Or glittering diamond, oft the jaspers found
Green but diaphanous; the topaz too
Of ray serene and pleasing: last of all
The lovely amethyst in which combine
All the mild shades of purple. The rich soil
Washed by a thousand rivers, from all sides
Pours on the natives wealth without control."**

"Jewels brought from India" were well known in the 3rd century of our era.*

Q. Curtius Rufus (41-54 A.D.) was, on the other hand, less commendatory of India's wealth in precious stones. Waves cast precious stones and pearls on its shores "nor has anything contributed more to the opulence of the natives, especially since they spread the community of evil to foreign nations; for these off-scourings of the boiling sea are valued at the price which fashion sets on coveted luxuries."* Strabo (about 65 B.C.-21 A.D.)* says India "produces precious stones, as crystal, carbuncles of all kinds, and pearls."

Many of the so-called Indian gems of Pliny's time doubtless came from Ceylon, but while Pliny* knew that Ceylon produced precious stones, he perhaps did not know what kind; certainly he does not mention the kind. Regarding Ceylon, Marco Polo (13th century)

* *Oration for the Law Manilia* VI.

* *De Medicamina Facie*.

* II, III, line 15.

* *Elegy* XV.

* *Elegy* XIII.

* *Asiatic Researches*, Trans. of the Society-Bengal, 1806, Vol. II, p. 421.

* Dio Cassius, *Hist.* op. cit. Vol. II, p. 247.

* Q. Curtius Rufus, *History of Alexander the Great*. McCrindle, *Ancient India*, p. 187.

* Book XV, Ch. 1, p. 67.

* Book IV, Ch. 24.

Geographical Sources of Gems

says: "The island produces more beautiful and valuable rubies than are found in any other part of the world, and likewise sapphires, topazes, amethysts, garnets, and other precious and costly stones." Today we would say he was a bit catholic in his taste regarding rubies, if he refers to the finely colored stones.

Pliny was right as to India's outstanding place as a source of gemstones in the past. To it we owe the names of many precious stones (tourmaline, opal, topaz, beryl, sapphire, etc.) and also the use in the trade of the words "Oriental" and "Occidental." Sir John Chardin, the great Huguenot jeweler, in the 17th century wrote: "It is natural that the East, being the mine or source of the precious stones, their names likewise should come from thence." From at least the beginning of the 16th century* in the jewelry trade, the finer gems have been called "Oriental" and those of inferior quality "Occidental," in many cases irrespective of their provenience. Indeed, in the middle of the 18th century, the French naturalist, Louis J. M. Daubenton, went so far as to classify precious stones into: Diamonds, Oriental gems, and Occidental gems. L. Dutens, his countryman (1772), however, recognized the incongruities of such a classification, and even earlier Robert Dingley stated that Oriental stones were only "supposed to be produced in the more eastern parts of our Continent." Thus the terms early degenerated merely into a means of distinguishing between superior and inferior gemstones. An unusually fine carnelian might be called "Oriental" and a mediocre one "Occidental."

* Camillus Leonardus,
The Mirror of Stones,
London, 1750, original
edition, 1502.

* Ch. 76.

* Book I, Ode 22.

Of rivers, the Ganges and the Acesieus (to the east of, but near, the Dneiper) are notable for gem production.* Perhaps on both of these rivers were traders in precious stones who gathered them from the hinterland to trade to visiting seafarers. Horace (65-8 B.C.) states that the Hydaspes which flows past the city of Nysa, India, abounds "with golden sands, pearls and precious stones."* When Pliny states that the diamond came from Arabia, he doubtless confused a trade station with a mining center, as he did when he reported the home of lapis lazuli to be Media. Massilia (modern Mar-

seilles) and Carthage were probably trade centers for garnets rather than sources. The mouth of the Po, long regarded as a prolific source of amber, was only a station on one of the main amber trade routes. Carmania is given as a source of *murrhine* vessels (agate mainly). Here we may, in part, have a source, but perhaps, on the other hand, a cutting center or a station on a trade route. Indeed, until a hundred years ago the confusion of a trading center with the actual mine was one of the commonest of errors regarding the source of precious stones. Pliny's sapphire locality, Aethiopia, suggests that the confusion among geographers of that country and India is old. An interesting analogy exists between the city of Golconda, India, 300 years ago, and Alabanda, Caria, in Pliny's time. Both were cutting centers, not gem localities, and yet the diamonds of Golconda are still referred to as if there were a mine there, and the garnets from nearby Orthosia were named Alabandic.

Gem occurrences of commercial importance, according to Pliny, were particularly numerous in India, Asia Minor, Egypt, and Arabia and, with the exception of Greece, were rare in other parts of Europe. Many of the authorities from whom Pliny quotes lived several centuries before his time and were naturally familiar with only certain gem occurrences in the older countries. Certain of these gem localities may have been exhausted by Pliny's time. While Pliny used discretion in not accepting certain reported gem occurrences (some of those of amber, for instance), some of the older authorities quoted may not have been too correct even when they wrote, and certainly were not in Pliny's time. Had Pliny consulted the gem merchants of his day, he perhaps would have found them unwilling to divulge the actual locality from which they got their gems, since they realized that a gem said to be from a distant land could be sold at a better price than one found near Rome. Had he done so, however, some of his localities would have been more up-to-date. On the other hand when Caesar, before invading Britain, called together the Gallic merchants who had traded

Geographical Sources of Gems

there, he ran against a blank wall. Perhaps Pliny would have found the same resistance on the part of the Roman gem dealers.

Three European precious stone localities, the Tyrolese emerald deposits, the Hungarian opal deposits, and probably the Oberstein agate deposits, if not known in Pliny's time, were soon afterward opened up. Max Bauer* believed that the Habachthal emerald mines were worked by the Romans. In Byzantine time, Constantinople was the distributing center for Hungarian opals. Records show that the mines were certainly worked in the 13th century and tradition says that at the end of that century there were 300 miners. Bauer leads one to infer that the Romans obtained opals from Hungary. Camillus Leonardus* says that in his time Germany produced so many and such a variety of jaspers that it "would be in vain to reckon them." In Agricola's time, fifty years later, such stones were frequently engraved. The famous Bohemian garnet deposits were known long before Pliny's time, as necklaces of drilled garnets occur in Bohemian graves of the Bronze Age. Further, at that time Bohemia and Italy were in commercial contact. However, this locality was apparently not known to Pliny; nor can I be sure that garnets used in Roman or Frankish jewelry (6th-7th century, A.D.) are from Bohemia. In England, jet was found long before the Roman invasion and the Whitby mines were worked, to our knowledge, even during the Roman occupation. Indeed, some English jet was apparently exported to Rome in Caesar's reign, although Pliny does not mention England as a source. In mining lead ore, the Romans must have also been familiar with the fluorspar of Derbyshire. Pliny's lack of familiarity with at least some of these deposits seems strange, since he had visited Germany, Spain, and France.

Pliny knew that sources of precious stones were not static for the old carnelian deposits of Sardes and Babylon were exhausted in his time while "New species of precious stones are repeatedly brought into existence, and fresh ones are found all at once, destitute of

* *Precious Stones*, 1904,
p. 316.

* *The Mirror of Stones*,
London, 1750, p. 112,
1st edition, 1502 A.D.

A ROMAN BOOK ON PRECIOUS STONES

* Ch. 74.

names.”* He also mentions a transparent stone from Egypt known to Theophrastus but unknown to him. “It is by no means improbable that it may have existed in his time, for stones we know disappear and new kinds are discovered.” In Pompey’s triumph, the Public Registers state that the conqueror displayed a chess-board of two precious stones “three feet in width by two in length,” leaving no doubt, as Pliny says, that natural resources become exhausted for he knew of no such sizable precious stones.

* *A Lapidary or the History of Pretious Stones*, Cambridge, 1652, p. 9.

Pliny merely suggests that precious stones are the result of a tropical climate, but listen to Thomas Nicols:* “The Climates fittest for the production of stones of excellent beauty are such, saith Boetius as do lie nearest the Tropicks: and therefore have the sunne ever neare them: They may be produced in any climate, but the more noble kind of gemms and pretious stones, are in their excellency plentifully to be found in the Regions of the orientall Indies, and that, without doubt, because it lyeth nearest the Tropick and so hath the sunne ever neare it.”

The source of gemstones as set forth in Pliny’s book on precious stones are tabulated below. It will be noted that for India, for example, the list is fairly complete: further that many localities are listed which today would not be mentioned because they produce few or no fine gems.

Africa and Asia

* Ethiopia	AETHIOPIA*	Carnelian	Crystal
* Part of Iran	Bloodstone	Malachite	Red Tourmaline
	Garnet	Onyx	CARMANIA*
* Egypt	Topaz	Opal	Girasol Opal
* Turkey	AEGYPTUS*	Sardonyx	Moonstone
	Agate	ARMENIA MINOR*	Murrhine vessels
* Iraq	Amethyst	Amethyst	Turquoise
	Emerald	BABYLONIA*	CYRENAICA
	Jasper	Carnelian	Garnet
* Iran	Nicolo	BACTRIANA*	GALATIA†
† Part of Turkey	Peridot	Emerald	Amethyst
* Part of Turkey	Plasma	CAPPADOCIA*	INDIA
* Part of Turkey	Smoky Quartz	Jasper	Agate
	ARABIA	CARIA*	Almandite Garnet
	Amethyst	Almandite Garnet	Amethyst
	Aventurine Quartz	Carnelian	Aventurine Quartz

Geographical Sources of Gems

Africa and Asia (Continued)

Beryl	Plasma	Malachite	
Bloodstone	Prase	PAPHLAGONIA*	* Part of Turkey
Carnelian	Red Tourmaline	Jasper	
Chrysoberyl Cat's-eye	Sardonyx	PERSIA*	* Iran
Chrysoprase	Smoky Quartz	Iris	
Crystal	Star Sapphire	Sapphirine variety of Chalcedony	
Diamond	Yellow Sapphire	Turquoise	* Part of Turkey
Green Aventurine	IONIA*	PHRYGIA*	* Part of Turkey
Jasper	Garnet	Agate	
Moonstone	LYDIA*	Jasper	* Part of Turkey
Onyx	Carnelian	PONTUS*	* Part of Turkey
Opal	MEDIA*	Citrine	* Part of Iran
	Lapis Lazuli	Topaz	

Europe

ALPES*	Crystal	PORTUGALIA†	* Alps
Crystal	Garnet	Crystal	† Portugal
Smoky Quartz	Moonstone	Garnet	
BRITANNIA*	Plasma	SCYTHIA†	* Great Britain
Amber	Smithsonite	Amber	† Part of Europe and Asiatic Russia
EPIRUS and ATTICA*	GERMANIA*	Azurite	* Part of Greece
Agate	Amber	Green Sapphire	* Germany
	HISPANIA*		* Spain
	Citrine		

Mediterranean Islands

CRETE	Crystal	Carnelian	
Agate	Green Jasper	SICILIA*	* Sicily
CYPRUS	Malachite	Agate	
Agate	Smoky Quartz	ARABICUS SINUS*	* Red Sea Islands
Azurite	LESBOS	Crystal	
Bloodstone	Agate	Iris	
Chrysocolla	PAROS	Peridot	

Dionysius Periegetes, who lived a short time after Pliny, in his geographical poem, popular in the Middle Ages, describes the gems of various countries, but pays little or no attention to their vegetable products. He describes the Baltic's amber;* the *adamas* of the Agathyria;* the *asterius* and *lynches* of the northern shore of the Aegean;* the crystal and jasper on the Caspian shores;* and also at the mouth of the Thermodon;* the beryl of Babylonia;* agate of the Chospes;* and the many Indian gems already quoted.*

* v. 315.

* v. 318.

* v. 38.

* v. 724.

* v. 781.

* v. 1012.

* v. 1075.

* vv. 1118-22.

A Historical Summary of the Ancient Commerce in Precious Stones

CHAPTER VII

 HE center of world trade in Pliny's time, Rome was the emporium to which the products of the whole world flowed. Aelius Aristides, who lived in the 2nd century A.D., wrote: "The stuffs of Babylonia and the jewels from the barbarous region of interior Asia reach Rome in much larger quantities, and far more easily, than the products of Naxos and Cynthus reach Athens. In fact, whatever commerce can lay hold of and ships can carry, whatever agriculture and the mines produce, whatever industry and the arts create, whatever exists in the earth, and whatever grows upon it, all this is gathered together in the market of Rome."

In ancient times precious stones were a much more important article of commerce than today. In those days the capacity factor per carrier—were it man, ass, camel, or boat—was small and of necessity the commodities carried, particularly between distant points, must needs be of high value, spices, fine fabrics and, to a lesser degree in total volume and value, precious stones. Important international trade in gems was inaugurated by the amber traders of the Baltic Sea at least 9000 years ago, to be followed about 3000 years later by the Babylonian merchants in lapis lazuli and the Egyptian purveyors of turquoise.

War, to the Romans, was a business, often with plunder as a side line. We find Augustus sending a military expedition against the Nabataeans and the Sabaeans, rich Arabian merchants of spices and precious stones, and Caesar, before he invaded Britain, as-

Summary of Ancient Commerce in Precious Gems

sembling from all parts of Gaul merchants who had traded in Britain and questioning them as to Britain's natural resources.

The Roman gem lover was not as particular as to the quality of his gem as is his American counterpart of today and many Roman gems are of so poor a quality that we wonder that the lapidary wasted his time upon them. Highly evolved commercial facilities and the expansion of gem mining furnish the modern purchaser a perfection in gems never available to the Roman. At that, the color contrast of Roman gems made effective jewelry, even though the quality of many of the gems was mediocre.

Amber, the desire for which in the early days was a great stimulus of international trade, was used by the Aurignacian and later Paleolithic men of northern Europe from between 50,000 and 25,000 B.C. onward: the source, presumably the Baltic coast of the North Sea. Its beauty of color, its transparency and, above all, its electrical properties—black magic to primitive man—made its ownership imperative. Later Baltic amber reached the Mediterranean, following river valleys south to the mouth of the Po or to that of the Rhone or to the Black Sea, following the Vistula and Dneiper to the southeast. About 1200 B.C. Phoenician merchants bartered for amber, particularly that arriving at the head of the Adriatic, and distributed it to the earliest of Greek cities and to many other Mediterranean people. The Greek name *electrum* evidently is of Phoenician origin (*elek*, resin). Indeed, the Greeks had more amber in the early days than they had until Rome became a great commercial power centuries later. So outstanding was this trade to the head of the Adriatic that Greek legend located the *Electrides Insulae* (Amber Islands) at the head of the Adriatic.* Later, instead of getting amber at the head of the Adriatic, Phoenician ships sailed to Britain, obtaining tin there and perhaps amber of local origin, or amber obtained by the Britons from nearby parts of the mainland. The Phoenicians themselves may even have reached the Baltic amber fields. These same traders

* Poem often attributed to Scymnus of Chios, Greek geographer of the 1st century, B.C., but probably by an unknown author; written about 91-76 B.C.

also probably obtained a little amber from pits along the Syrian Coast, but their main source of supply was doubtless the Baltic.

About 600 B.C. Phocaea founded Massalia (Marseilles) to control the trade in British tin and Baltic amber which came down the Rhone. Eventually Greeks, through this and other Greek colonial cities (including those on the Black Sea), became an important factor in the amber trade. The increased use of amber beads among the Etruscans soon thereafter indicates how large was the trade. About 340 B.C. Pytheas, a Massalian Greek astronomer and explorer, apparently sailed to the Baltic amber region, and he mentions that amber is cast upon the shores of the Isle Abalus by the high spring tides and tells us that the Guttones of East Prussia traded it to the neighboring tribes. Herodotus, a century earlier, although he recognized that amber came "from the remotest parts," was not willing to admit that it came from the river Eridanus (our Po) in western Europe.* Timaeus (about 260 B.C.) gave the source as the island Basilia or Raunonia, and not Abalus; Diodorus Siculus* merely mentions the first name. Xenophon of Lampsacus calls it Baltia.*

The Etruscans and Romans had Baltic amber in the early days of their civilization, and by Pliny's time it was a common but precious commodity, arriving largely by the land routes. The Germans brought it as far as Pannonia and from there it was transported to the mouth of the Po. Nero even had Julianus Carnuntum, his gladiatorial fight manager, send a knight to Prussia to obtain, by trade, a store of amber. Tacitus* gives details as to the trade of his time (born 55 A.D.), stating that the Suebi collect it either from shallow parts of the sea or on the seashore, and were inclined to pay no attention to it until "our luxury made it esteemed." Indeed, the barbaric tribe was a bit baffled by "the price they receive for it." We are ignorant as to whether the Romans of Pliny's time obtained amber from the Sicilian mines (artifacts of this amber are found in the ruins of the Swiss Lake Dwellers).* W. Arnold Buffum* knows of no reference to this source

* *Thalia* III, 115.

* v. 23.

* Book IV, Ch. 23.

* *Germania*, Ch. 45.

* L. Reutter, C. R. Ac. Sc. t CL 11, 1916, pp. 421-3.

* *The Tears of the Heliades or Amber as a Gem*, London, 1898, p. 13.

Summary of Ancient Commerce in Precious Gems

prior to 1639 A.D.* Buffum, however, believes some of the amber from Italo-Greek and Etruscan tombs is of Sicilian origin. Nor do we know that the Romans were familiar with the mines of Scythia mentioned by Philemon (amber occurs in several places in Russia), the Syrian mines once worked by the Phoenicians, the Italian deposits of Liguria (operated in the time of Theophrastus), nor those near Bologna. Strabo,* Pliny's predecessor by a generation, mentions them. Amber is still found at Scanello, Castel S. Pietro, and in the Cesenate, Italy. We may add that amber was in the past from time to time found on the shores of England and Scotland. Pliny, quoting Nicias and Ctesias (about 398 B.C.), says that amber occurs in India. Archelaus reports that amber from India still has the bark sticking to it! Possibly some other less aged resin is referred to or this may be a reference to the Burmese mines, before World War II relatively important. That the latter inference is not impossible is indicated by the fact that the Burmese mines were known to the Chinese in the Han Dynasty (206 B.C.-220 A.D.). Normally, however, Rome exported amber to India and part of this apparently reached even China.

The successive civilizations which occupied the Mesopotamian valley were fortunate in their position, midway between the eastern and western civilizations. The early Sumerians doubtless got their precious stones from the nearby nomadic peoples; the wandering life of the latter made them familiar with the minerals of the mountains and plains. Later, the people of the Mesopotamian cities became great merchants. From 3000 B.C. on they not only had important trade relations with nearby Asia, but with Egypt and India as well. In the Code of Hammurabi (1800 B.C.), there are laws for the protection of the wandering trafficker in gems, and soon after the state armies protected the creeping donkey caravans of the Babylonian merchants. The Mesopotamian region and northwestern India were in commercial and cultural contact in the 3rd millenium B.C., if not in the 4th, and Ur of the Chaldees had Indian products. Again,

* Carrera *Memorie Storiche di Catania*.

* Ch. 6, Para. 2.

from about 900 B.C. to 562 B.C. the Assyrians imported from India teakwood and many other products. The trade was probably largely by caravan, but that going by sea was controlled by the Dravidians, who, availing themselves of the monsoons, voyaged from the southwestern ports of India to Babylon. It was, however, partly in the hands of Aryans.* At Babylon these Indians became acquainted with the Semitic alphabet which became the basis of the alphabets of India, Burma, Siam, and Ceylon. Prior to this time, India's less valuable precious stones (agates, for example; indeed, the fine quality of the carnelian used by the people of Indus Valley in the 3rd millenium B.C. suggests that India's finer agate mines may have been known at that early date) had doubtless been found and from 800 to 600 B.C., the diamond, ruby, and sapphire are believed to have first been known to man. India at that time had an established and rather highly developed industry in jewelry and precious stones. Then, as now, the Hindu wore costly jewelry. The mines were the monopoly of the local rulers and duties on precious stones were heavy.

The Phoenicians were not only early traffickers in amber, but in other luxuries as well. They were daring seamen, and the most aggressive and successful traders of their day. Tyrian industry furnished trade goods, for Tyre had many skilled craftsmen. Homer describes

“ . . . a silver bowl well wrought,
By Sidon's artists cunningly adorned,
Bore by the Phoenicians o'er the dark blue sea.”

To satisfy less discriminating nations, she had mass production of salable trade gadgets; for instance, she flooded the Mediterranean market with crudely engraved gems. The Prophet Ezekiel* (Ezekiel was sent into captivity in 598 B.C.), referring to the commerce of Tyre, mentions her trade with southern Arabian gem merchants. Tyre got Indian stones by caravan from the coast of Oman; likewise, perhaps, by an all-caravan route. By 550 B.C. Phoenician merchants had organized sea-borne trade between the head

* J. Kennedy, *Journal of the Royal Asiatic Society*, London, 1898.

* Ezekiel 27:22.

Summary of Ancient Commerce in Precious Gems

of the Red Sea and the southern coasts of Arabia and Persia.

Carthage, founded by Phoenician colonists, obtained gems (garnets, certainly; others, likely) by caravan trade from the Sahara, Sudan, and other parts of Africa. Some of these reached Rome.

The Etruscan looked to Phoenicia, "the mart of nations," "whose merchants were princes, whose traffickers" were the "honourable of the earth," for his jewels in the 8th and 7th centuries B.C. For the next 250 years the Etruscan and Roman nobles imported their jewelry from Phoenicia, Egypt, and Greece, although even at that early date they must have had some Greek artists in their midst, and the Etruscans themselves eventually became master goldsmiths. By the 6th century Roman women got their jewelry from the Etruscans.

The Sabaeans of southern Arabia traded with India at least as early as 1000 B.C., nor was India the only source of gems with which these enterprising merchants were acquainted. They guarded as carefully the source of their gems from their competitors as did the Phoenicians their source of British tin. Indian products were shipped to the coast of Oman, thence by caravan to the Sabaean Kingdom (some cargoes probably arrived direct by sea), whence they were redistributed to the Egyptians, Assyrians, and Phoenicians, and later to the Romans. Sargon of Assyria (715 B.C.) received precious stones as tribute from Arabia. The Prophet Ezekiel,* referring to the commerce of Tyre, says: "The merchants of Sheba and Raamah, they were thy merchants; they occupied in thy fairs with chief of all spices, and with precious stones and gold." The Queen of Sheba, it will be remembered, gave Solomon "of spices very great store, and precious stones."* Aristaeas, who probably wrote in the 7th century B.C., tells us that Arabian merchants brought precious stones to Italy and he clearly states that the Sabaeans acted as merchants rather than as producers of precious stones. The Kingdom of Axium also had at a somewhat later date contact with India and, indeed,

* Ezekiel 27:22.

* I, Kings 10:10.

A ROMAN BOOK ON PRECIOUS STONES

Rome kept friendly commerce with that kingdom to assure herself an adequate supply of Indian products. Emperor Augustus evidently became jealous of the wealth of the Nabataeans and Sabaeans, who "exchanged their aromatics and precious stones for silver and gold, but never expended with foreigners any part of what they received in exchange." In consequence, he sent a mighty punitive expedition under Aelius Gallus, a general who soon became the victim of the wiles of the Arabian chieftians and the difficulties of the desert country.*

* Strabo, Book XVI.
Ch. 4, Para. 22.

Arabia's trade with India was doomed when Hippalus in 47 A.D. solved the riddle of the monsoons. Roman trade with India sprang up overnight and the luxuries of India found their way to Europe by the Red Sea, increasing tremendously the supply of precious stones available to the Romans. Soon Indians were seen in Alexandria and Roman citizens of non-Latin blood, Greeks, Jews, and Egyptians settled in the ports of India.

Egypt in predynastic days (prior to 3400 B.C.) had commercial contacts with the Sinai Peninsula and with the Mesopotamian valley, and certainly by 2900 B.C. with the Syrian coast, Crete, and the Sudan. Trade was pushed southward, and by 2750 B.C. Egypt was trading with Punt (Somaliland?). In the XIIth Dynasty (about 2000 B.C.), her interest in overseas products increased and she probably had at her command Arabian products and even, conceivably, some of those of India. In the XVIIIth Dynasty (1580-1350 B.C.), her commerce further expanded. Phoenician merchants were permitted to establish factories at Memphis and the wealth of Asia Minor, the Near East, northeastern Africa, and the Greek isles were hers. A few carnelians and garnets from India probably filtered into Egypt via Arabia a thousand years before Christ. Sapphires, zircons, and the other more valuable Indian stones, however, reached Egypt only in the time of the Hellenistic Ptolemies. Ptolemy Philadelphus (309-246 B.C.) sent one Dionysius to southern India to open up commercial relations with that country. Agatharchides

Summary of Ancient Commerce in Precious Gems

(181-146 B.C.) states that in his time Egypt's trade with India was very profitable. Strabo* states that about 170 B.C. a shipwrecked Indian sailor, half starved and exhausted, was cast upon the shores of the Red Sea. Nursed back to health, he promised to show the way to the Orient and Ptolemy Euergetes II, then ruler of Egypt, sent several merchants with him to India. Among them was a Greek, Eudoxus of Cyzicus, (he made two trips to India, 120 B.C. and 113-2 B.C.: See also Pliny)* who after trading his Egyptian merchandise for spices and precious stones, gives us one of the earliest descriptions of Indian gem mining: "Some of the Indians collect from amongst the pebbles of the river, others they dig out of the earth where they have been formed by the moisture as crystals are formed with us." It is stated that his rich cargo of spices and precious stones was seized on his return by Ptolemy Euergetes II, who had a monopoly on eastern trade. Alexandria was an important emporium of Indian goods, largely obtained (probably up to about 100 B.C.) from the Sabaeans and later direct via the Red Sea ports of Berenice and Myoshoormos.

* Vol. I, p. 149.

* Book III, Ch. 67.

Hecataeus of Miletus, the father of geography (about 520 B.C.), is the first European to mention India, although Homer knew tin by its Sanskrit name. According to Herodotus, India (about 570 B.C.) paid tribute to Persia in gold, and in the campaign of 512 B.C. Persian troops annexed large areas of the Punjab and the Sind. In 510 B.C. Scylax of Caryanda, a Greek in Darius' employ, descended on the Indus, crossed the Indian Ocean, and finally reached Persia. Intercourse between India and the more westerly civilizations was becoming a reality. Herodotus, however, (about 443 B.C.), who traveled widely among the Persians, then in commercial touch with India, does not mention the precious stones of India and these, doubtless hoarded by the Hindu rulers, must have rarely reached Persia in his day.

In 479 B.C., when the Greeks defeated the Persian General Mardonius, plunder rendered them luxury-conscious. Later the Greeks probably obtained some

gems from India through the Persians and the Sabaeans, and rumors of India's wealth in spices and precious stones may have led Greek merchants thither before Alexander the Great's time (356-323 B.C.). Indeed, some Indian spices were common in Greece in the time of Hippocrates, the great physician (460-357 B.C.). We know that Alexander promised his soldiers plunder, as a result of his Indian campaign, which would dwarf the spoils of Persia. Soldiers were to fill with pearls, ivory, gold, and precious stones, not only their own homes, but those of all Greece. As a result of the Macedonian's conquest, the dispersal of the wealth of Persia and India, the accumulation of centuries of hoarding, stimulated world trade enormously. It should be emphasized that Alexander the Great's routes passed close to the turquoise locality of Nishapur, Persia (first mentioned, so far as I know, by Amur-ru-Lais—from 878 to 903 A.D. ruler of Khorasan—but probably worked much earlier), the Badakhshan lapis lazuli locality (probably known to the Sumerians); the Badakhshan ruby mines (mentioned by Istakhri 951 A.D., but probably known considerably earlier), and the Khotan nephrite deposits (known certainly in the reign of Wu Ti, 140-87 B.C., and perhaps 2500 years earlier).

* Photios, *Excerpta*.

The road to the East was open, not to be closed in classical times. Fine eastern garnets, sards, amethysts, beryl, topaz, and sapphire became known to the Greeks, and the more precious stones first appeared commonly in Greek jewelry. Ctesias (415-397 B.C.)* knew of the Indian agate mines and states that Assyria in his time obtained from India sard and onyx for her finer seals.

In support of his assertion, sard and sardonyx first appeared in the Mesopotamian valley in Assyrian times. He also mentions the gem *pantarba*, which attracts to itself sealstones and has many other marvelous properties. Unfortunately, I cannot identify it!

Seleucus Nicator, ruler of Syria, in 305 B.C. led an army into India even further than had his predecessor, Alexander the Great. About 20 B.C., according to Florus, ambassadors from southern India came to the

Summary of Ancient Commerce in Precious Gems

court of Augustus with gifts of precious stones and pearls.* In the next six years two other embassies arrived. Again, under Constantine (306-337 A.D.), ambassadors from India arrived with "shining" gifts.*

Roman-Indian commerce in spices, gems, and fine textiles was highly developed by Pliny's time, the first, in money value, being the most important of the three. It is described in detail in the *Periplus of the Erythraean Sea* (60 A.D.±).* Most Indian gems arrived in Rome either via Alexandria, by one of the Arabian towns, or by one of the Parthian cities. Yearly, in July, 120 ships sailed from Myoshoormos on the Red Sea, later from nearby Berenice. Taking advantage of the monsoons, in about seventy days the boats reached ports on the Malabar coast. Here they undoubtedly met with other ships which went east from that coast and from Ceylon, presumably as far as China. After loading, the Roman vessels returned to Egypt at the year's end. The cargo was then transported by camel from the Red Sea to the Nile and down it to Alexandria. A fleet carrying gems sailed yearly, under the Empire, from Alexandria to Puteoli (modern Pozzuoli) near Rome.

Contact with oriental luxury caused the Romans to overindulge in costly stuffs and in the use of jewels; for when they enjoyed the mastery of the Indian trade, the Romans had the wealth to indulge in their tastes, no matter how fantastic or extravagant they might be. The fact that false stones were less common in Rome in the second than they were in the first half of the 1st century A.D. was due to the influx of fine gems into Rome from India after the secret of the monsoon was known. Practically every known Indian gem was in use in Pliny's time but the prices demanded for them were exorbitant. The stones, besides the first cost and export and import duties, had to stand heavy transport charges, and the Roman gem merchant in setting a price had to consider not only his own overhead, but the great risk of shipwreck or piracy which he or his agents had been subjected to in bringing the stones from India. Profits, provided the fleet arrived safely, were enormous, for Pliny tells us that these eastern

* Watson translation, Bohn Library, London, 1889, p. 423.

* Eusebius, *Vit. Const.* I, IV c. 50.

* Wilfred H. Schoff, translator, London, 1912.

A ROMAN BOOK ON PRECIOUS STONES

* Book VI, Ch. 26.

* Wilfred H. Schoff,
London, 1912, p. 39.

* *De publicanis et
vectigalibus*,
Digest lib. XXXIX
tit. IV, Para. 15.

* Book XXXIV.

* C. W. King, *Antique
Gems*, London, 1860,
pp. 9, 50.

luxuries were sold at fully one hundred times their original cost.* Not only the Indian merchants, but those of all intermediate commercial centers, hid the source of the gems sold to the Romans and exaggerated the dangers of mining them, in part to restrict competition and in part to enhance their value. In consequence, many trade centers became, in the eyes of the ancients, the source of precious stones. Thus, according to the *Periplus of the Erythraean Sea*,* through the Indian port of Barbaricum, on the delta of the Indus, both Persian turquoise and Afghanistan lapis lazuli were shipped, in the 1st century of our era, to Rome. A fairly complete list of gems imported can be gotten by the Roman tariff law of the time.*

While all of the then known world was ransacked by Rome for precious stones, India was considered the source par excellence of fine gems. The Indians, having neither copper nor lead mines, "are content to part with their pearls and precious stones unto merchants by way of counterchange of metals."* Indeed, metals have always moved east in exchange for gems, spices, and silk from the Orient. Rome paid for its luxuries, not only with base and precious metals (for even then India was the sink of gold and silver), but to a much lesser extent with textiles, amber, emeralds, peridot, coral, glassware, and wine. Roman gold coins of Tiberius and Nero (42 B.C.-68 A.D.) are commonly found on the Malabar coast. Pliny states that yearly precious metals worth the equivalent of \$4,250,000 were exported from Rome to India. The debasement of coinage under Nero was, in part at least, due to India's favorable trade balance.

The Indian origin of the sardonyx, of many classical engraved gems, and even of sapphire ornaments is attested by the fact that such gems are pierced for suspension as beads.*

Ceylon and India were in commercial contact, at least by 543 B.C., and the name of the island was known to the officers of Alexander the Great. Megasthenes (about 300 B.C.) mentions the pearls of Ceylon but not its precious stones. In the time of the Emperor

Summary of Ancient Commerce in Precious Gems

Claudius (reign began 41 A.D.),* Annius Plocamus had farmed the revenues of the Red Sea. One of his freedmen sailing around Arabia was carried by adverse winds to a landfall on Ceylon. He stayed there six months and, as a result, the king of Ceylon, seeking an alliance with Rome, sent Rachias and three others on an embassy to Rome. These Singhalese informed the Emperor Claudius that in their country they valued greatly their pearls and precious stones. The precious stones of Ceylon in Pliny's time, however, were still received indirectly through India, for direct commerce between Rome and Ceylon did not start until about 150 A.D. We may, however, add that the author of the *Periplus*, a contemporary of Pliny, mentions that Ceylon produces "transparent stones." Ptolemy, an Alexandrian living about 150 A.D., mentions beryl and sapphire as products of Ceylon.* In his time Graeco-Egyptian traders apparently knew the island well. Cosmas Indicopleustes* probably gained his knowledge of Ceylon's wealth in gems from Sopatrus, a Romanized Greek who visited Ceylon about 510 A.D., although Cosmas himself may have visited India. At Sigiriya and other ancient Ceylonese cities, Roman coins of the 2nd and 5th centuries are frequently found.

Roman coins of the 2nd century A.D. have recently been found among the ruins of Indo-Chinese towns. India and China seem to have had commercial relations as early as the 4th century B.C. Alexander the Great's admiral, Nearchus, knew of "Serian cloths which reached India from the north." In 140 B.C. Chinese ships with a cargo of gold and silks sailed for Conjevaram, a port near Madras. This cargo they expected to exchange for pearls, crystal, and precious stones. An embassy from China was received by Mithridates II of Parthia (124-88 B.C.). Of course, Rome and Parthia were in commercial contact in the 1st century B.C. Horace (65-8 B.C.) mentions the Seres.* Virgil in the *Georgics*,* published in 31 B.C., knew of Chinese silk and how "the Seres comb the slender fleeces from the leaves." In the time of the Emperor Augustus, overland trade continued between China and Parthia, the

* Book VI, Ch. 24, 89 and 91.

* Ptolemy's *Geography of India and Further Asia*, McCrindle edition, Chap. 4:1.
* *Christian Topography*, Book VI.

* Book I, Ode 12.

* Book II, line 120.

A ROMAN BOOK ON PRECIOUS STONES

Chinese traders going westward as far as the Stone Tower, approximately where Balkh now stands. Silk was the great trade incentive between China and the West, and this trade expanded markedly toward the second half of the 2nd century B.C. The historian Florus* mentions Chinese among the foreigners who came to the court of Augustus. He says: "Nay the Seres came likewise and the Indians who dwelt beneath the vertical sun, bringing the presents of precious stones and pearls and elephants." But even in Pliny's time,* Rome and China were not yet in direct commercial contact, although the products of the two countries were known to one another. Amber from Rome reached China probably through Syria, while jade was used to a small extent by the Romans. It may be added that Roman coins have been found in the Chinese province of Shansi dating from the time of Tiberius (14-37 A.D.) to that of Aurelian (212-275 A.D.).* Pliny mentions the iron and furs of Seres. So, for a considerable time, India served as the link between the two great empires of the time, China and Rome. Marinus of Tyre, in the 2nd century A.D., says that in his time Rome exported amber to China, and a Chinese work of 350 A.D. mentions amber as an export of Rome to China. In 97 A.D. Pan Ch'ao, the famous Chinese general, dispatched his aide westward as an ambassador, and he at least reached Babylonia. He speaks of the tenfold profits enjoyed by the Roman merchants trading in India, and of the riches in precious stones of what must have been modern Antioch. Marcus Aurelius is said to have sent ambassadors to China in 166 A.D., but instead of an official embassy, it may have been but a party of Syrian merchants.

The Egyptians apparently first instituted tariffs on precious stones and a century before Pliny's time we know what duties were paid on gems upon entering Egypt and again at Alexandria when re-exported. Tiberius Gracchus, about 133 B.C., established duties on various luxuries entering Rome.* Cicero (106-43 B.C.) in *Pro lege Manilia* mentions three Roman import duties, the first being the *Portoria*, or that

* Lib. IV, 12.

* Book VI, Ch. 20.

* Wm. Stearns Davis,
*The Influence of
Wealth in Imperial
Rome*, New York,
1913, p. 91.

* Florus, Watson translation, Bohn Library,
London, 1889, p. 449.

Summary of Ancient Commerce in Precious Gems

paid at a Roman port of entry. Later, precious stones, like other luxuries, paid a high duty on entering the Roman empire; for example, under the Emperor Augustus (31 B.C.-14 A.D.), articles of luxury paid from two and one half to twelve and one half per cent *ad valorem*, precious stones being in the higher brackets. Custom duties also existed between the various Roman provinces. Other tariff laws were enacted under the Emperors Marcus Aurelius, Commodus, and Alexander Severus. Under the law of Severus (222-235 A.D.), the diamond and the emerald paid a duty of twelve and one half per cent.

The Value and Relative Rank of Precious Stones in Pliny's Time

CHAPTER VIII

* Ch. 58.

IN Book XXXIII on Metals,* Pliny gives us his ideas as to commodity prices, generalizations doubtless to him equally applicable to gems. He gives tentative commodity prices, although he is aware that they vary with the locality and from year to year. Maritime and other transport costs and the price paid by the merchant in a foreign land effect the price of an article in Rome, and the merchant may skyrocket the latter, provided he has a corner on the market.

* Book XXXVII, Ch. 1.

In Pliny's time, as in our day, certain gems were "regarded as beyond all price."* The relative prices of gems in Pliny's time appear to have been more or less standardized, a diamond, for example, being many times more valuable than some of the less precious stones. The factors determining value were, broadly, those which hold today.

To be valuable, precious stones must be:

A—Beautiful. Apparently transparent gems were more highly valued than semitransparent or opaque gems, according to Gaius Valerius Catullus (born 87 B.C.).

B—Scarce. Agate was formerly held "in high esteem, but now held in none." While agate occurs in large pieces, the cause of its fall from grace appears to have been the fact that originally it was found only in the Achates River, Sicily, "but has since been discovered in numerous other localities." Theophrastus, on the other hand,* who wrote almost four centuries before Pliny's time, calls it "an elegant stone," "sold

* John Hill, *History of Stones*, London, 1746, p. 87.

Value and Rank of Precious Stones in Pliny's Time

at a great price." The peridot, Pliny says, "is still held in very high estimation for its green tints; indeed, when it was first discovered, it was preferred to every other kind of precious stone." To highlight gem scarcity, jewelers have always, even to this day, emphasized the dangers which traders undergo in procuring gems, the so-called gem dealers' tales. Pliny tells of the slaying of the dragon to get *draconites*; the occurrence of turquoise in inaccessible craggy heights, the stone only to be shot down with slings, and the dangers of procuring crystal in the Alps. In commenting on the fact that *cassia* grows in marshes, where "it is protected by a frightful kind of bat armed with claws and by winged serpents," Pliny adds, "All these tales, however, have been invented for the purpose of enhancing the prices of these commodities."* Inferior stones were given the name of finer varieties to enhance their value; for example, mere rock crystal was called *adamas* (other varieties of *adamas* were actual diamonds),* just as today certain tradesmen call rock crystal by the name of "Bristol diamond," "Alencon diamond," and "Arkansas diamond."

* Book XII, Ch. 42.

* Ch. 15.

C—Small. The largest diamond known in the time of Pliny was the size of a hazelnut (say roughly from five to ten carats) and the famous opal of Senator Nonius was no larger.* Sardonyx, on the other hand, was found in India large enough to be fabricated into sword hilts; *murrha*, crystal, garnet, and other stones were found in pieces large enough to be cut into drinking cups. Pliny had himself seen a jasper "fifteen inches in length." The *catochitis* (bitumen?) occurs "of larger size than the other precious stones," although from Pliny's fragmentary description we would scarcely class it as a precious stone.

* Ch. 21.

D—Large. In some species value increased with size. Pliny describes as especially valuable large blocks of rock crystals, and the weight of the limpid rock crystal worn uncut (called *aconteta*) is taken into consideration in their valuation.

E—Fashionable. We are informed that yellow gems "are in no particular request."* *Chryselectrum* (our

* Book XXXIII, Ch. 19.

* Ch. 43.

* Ch. 23.

* *Satire* VI, lines 198-200.

citrine and hence a yellow gem) by Pliny's time had "altogether gone out of use in jewelry."* The value of a stone may be enhanced by its use by a "socialite" and the rivalry among others to imitate him or her; for example, the Emperor Claudius, who was infatuated with the emerald and sardonyx.* Martial in one of his epigrams tells of the vanity of the Romans in tracing their gems back to a Cleopatra or an Antony. Juvenal* tells of a Roman social leader who is assured by the dealer that a stone shown her is the very one

"That once on Berenice's finger shown,

The pledge which on a guilty sister's hand Agrippa placed."

Such historical associations add value to gems today; otherwise, we would hear little of the Kohinoor diamond.

Caligula, hard pressed for money, sensed his prestige as emperor and, in consequence put up the most precious movables of his palace at auction. "This was my father's; this necklace was that which my mother us'd to wear; Anthony brought this rare piece out of Egypt; Augustus heretofore won these spoils from his enemies." He sold all and the proceeds he gave to his soldiers or used in stupid extravagances.*

* *The History of Dio Cassius*, abridged by Xiphilin; Francis Manning, translator, London, 1704, Vol. I, p. 280.

* Book XXXIII, Ch. 49.

* Book XXXIII, Ch. 53, 55.

In Pliny's day, fashion ruled even the silverware market. At one time the Furnian plate was most popular, at another the Clodian, and at a third the Gratian.* Excessive prices were paid for the works of certain artists, especially for those of Mentor.* Silversmithing had passed its peak before Pliny's time.

Pliny tries to introduce another value factor, namely, utility; crystal and *murrha* are valuable for goblets; in his opinion, amber has no useful application; therefore, he wonders that it is valued. He forgets that precious stones are valued for their beauty.

In classical times, as in our own, women ruled the consumers' market. Certain gems were placed in the highest rank: "in obedience more particularly to a decree that has been passed by the ladies to that effect."*

* Ch. 23.

With *sandastros* (aventurine), the price advances with the "greater number of stars upon the stone." This is true today, stones characterized by opalescence and

Value and Rank of Precious Stones in Pliny's Time

labradorescence being more highly esteemed as one or the other of these characteristics is more perfectly developed.

Pliny adds that glass vessels closely resemble crystal; and yet "they have only tended to enhance the value of crystal, and in no way to depreciate it." When, a generation ago, synthetic sapphires and rubies came on our market, fear was expressed that the natural gems would lose their value; the price fell for a couple of years, but thereafter the trend changed, and at present both gems are more valuable than ever.

Perhaps the earliest price quoted for a gem is that of Theophrastus (about 300 B.C.)* for the *anthrax* (probably in this instance ruby, rather than garnet), namely, "a small ring stone used to sell for forty *aurei*" (say \$205). Aristophanes, on the other hand,* tells of a signet ring which cost but a *drachma* (say twenty cents) and a seal ring three *obols* (ten cents).* The prices suggest that the stones thereof were paste rather than gems. We may recall that Aelian,* after referring to the numerous gem engravers in the Dorian colony of Cyrene, states that the poorest of the people had a ring worth ten *minae* (say \$200 to \$250).* While Pliny does not state the per carat price of gems in his time, he gives us the order in which they were ranked, in addition to the prices of *murrhine* and crystal cups and of amber objects d'art. "Of objects that lie upon the surface of the earth, it is crystals that are most highly esteemed; of those derived from the interior, diamond, emerald, precious stones, and *murrha* are the things upon which the highest value is placed."* We might add, for curiosity sake, that Indian asbestos was sold at a price equal to that of the finest pearls.*

Murrhine cups were exceedingly costly. One holding no more than three *sextarii* (2.97 pints) cost 70,000 *sestertii* (\$2975); a basin, 300,000 *sestertii* (\$12,750), and Nero paid for a single cup 1,000,000 *sestertii* (\$42,500).* Rock crystal was apparently cut into even larger cups than *murrha* (two quarts and even five gallons, 3.8 quarts), and was somewhat less expensive, the top price mentioned for a basin of rock crystal being

* Cl. c. Ch. 31.

* *Plutus*, line 883, first produced 408 B.C.

* *Thesmophoriazus*, about 410 B.C.

* *Var. Hist.* XII, Ch. 30.

* See also the Greek poet Eupolis.

* Ch. 77.

* Book XIX, Ch. 4.

* Ch. 7.

A ROMAN BOOK ON PRECIOUS STONES

* Ch. 10.

150,000 *sestertii* (\$6375).^{*} Of course, such prices covered not only the value of an unusually large and fine block of raw material, but the enormous amount of artistic labor involved in shaping and engraving the cup.

The price of amber, while less than that of *murrha* or crystal, varied with its variety, that of the color of Falernian wine being most valuable. "So highly valued is this as an object of luxury, that a very diminutive human effigy made of amber has been known to sell at a higher price than living men, even in stout and vigorous health."^{*} At the time, good, sturdy men slaves were worth from \$50 up.^{*} The price of amber was, however, less than that of most precious stones, and certainly less than that of amethyst, since amber served as the base of an imitation of that gem and of many others.

* Ch. 12.

* W. Warde Fowler,
*Social Life at Rome
in the Age of Cicero*,
London, 1908, p. 211.

In describing the gems, Pliny begins with those "which are the most highly esteemed."^{*} His ranking is as follows:

* Ch. 14.

* Book XX, Ch. 1.

1—Diamond, "that pride of luxury and opulence,"^{*} "the substance that possesses the greatest value, not only among the precious stones, but of all human possessions is the diamond; a mineral which for a long time was known to kings only, and to very few of them."^{*}

* Ch. 15.

* Book IX, Ch. 54.

2—Pearls of India and Arabia, which he recognizes as marine products.^{*} Pearls must have been almost as valuable as diamonds, for in the last mentioned reference, he accords them "the very highest position among the valuables."

* Ch. 18.

3—Emerald, the price of which is so exorbitant that he feels he "should point out their defects."^{*} Albius Tibullus (54-19 B.C.), who apparently knew nothing of the diamond, ranks pearls and emeralds as the most valuable of man's possessions.^{*}

* *Pastoral Elegy*.

* Ch. 21.

4—Opal is fourth.^{*} The opal of the Roman senator, Nonius, which from the context was not larger than a hazelnut (say three to five carats) was estimated to be worth 2,000,000 *sestertii* (from \$95,000 to \$100,000 of our money, or per carat from \$20,000 to \$30,000). A superlative black Australian opal of that size today

Value and Rank of Precious Stones in Pliny's Time

might be worth \$750 to \$2000 (\$150 to \$500 a carat).

The above mentioned stones "it is generally agreed belong to the highest rank, in obedience more particularly to a decree that has been passed by the ladies to that effect. There is less certainty with respect to those upon which the men as well have left to form a judgment." The value of each variety depends more particularly upon the taste of the individual and the demand that exists therefor.*

5—Sardonyx is given the next place after the opal.* Thereafter, in order,—although in his Chapter 23 he indicates there may be some difference of opinion—follow onyx, *carbunculus* (ruby, spinel, and garnet), aventurine, tourmaline (identification probable but not certain), carnelian, peridot, turquoise, prase, plasma, *nicolo*, malachite, jasper, azurite, lapis lazuli, amethyst (including other purple gems), sapphire, topaz, citrine, star sapphire, and iris.

Plutarch (46-120 A.D.), who lived a generation after Pliny, often agreed with our writer. In his *Love of Wealth* gold, silver, ivory, and emeralds* are listed as the most valuable of the world's possessions. He adds in *Conjugal Precepts* that "pearls and diamonds are not the purpose of an ordinary purse."*

We would today agree with Pliny in ranking the diamond, pearl, and emerald among the most valuable gems, but we would add to them, of course, the ruby and thereafter the sapphire. Pliny gives us but a hint as to the money value of gems, but if I am right, the per carat price was higher than that of today, without considering the greater purchasing power of money in Pliny's day. As, from the text, the diamond must have been the most valuable of all gems, we can infer that, even as expressed in currency, gems were much more expensive in Pliny's day than in our own. Then, stones upon which we today would place only a low valuation brought good prices; a ring set with jasper adorning a woman's statue in South Spain cost her son 7000 *sestertii* (\$350). Even as late as the 4th century of our era, a jasper brooch was worthy of being part of the costume of a bride.*

* Ch. 23.

* Ch. 23.

* *Plutarch*, Vol. II,
Wm. W. Goodwin,
Boston, 1883, p. 295.

* *op. cit.* Vol. II, p.
506.

* Claudian, *Pan. to 6th*
Con. of Honorius,
line 744.

A ROMAN BOOK ON PRECIOUS STONES

* Ch. 77.

Regarding gold, Pliny says, as a commodity it "hardly holds the tenth rank," and silver "hardly the twentieth."* Of precious stones, it is evident that the diamond, emerald, pearl, and amber cups (of course, of organic origin), and perhaps the sardonyx and probably other precious stones, were then more valuable than gold. Ovid, indeed, is supposed to have said, although I cannot find the reference, that "jasper is more valuable than gold, virtue than jasper."

* Ch. 3.

Collectors of the unique will undoubtedly understand the story of Ismenias (about 400 B.C.), the flute-player, a fop, but a passionate lover of gems. He desired an engraved emerald priced by a Cyprian dealer at six golden *denarii* (\$24). The jeweler reduced the price to four *denarii*, whereat Ismenias remarked, "By Hercules, he has done me a bad turn in this, for the merit of the stone has been greatly impaired by this reduction in price."* We may add that Aristophanes (about 444-380 B.C.) describes musicians as "lazy, long-haired fellows with fingers covered with rings down to the nails."

Gem Mining in Pliny's Day

CHAPTER IX

HE Romans mined metals, gems, and industrial minerals. "We trace out all the veins of the earth, and yet living upon it, undermined as it is beneath our feet, are astonished that it should occasionally cleave asunder or tremble; as though, forsooth, these signs could be any other than expressions of the indignation felt by our sacred parent. We penetrate into her entrails and seek for treasures in the abodes even of the Manes."* "We also search for gems and certain small pebbles, driving our trenches to a great depth. We tear out her (Mother Earth's) entrails in order to extract the gems with which we may load our fingers. How many hands are worn down, that one little joint may be ornamented! If the infernal regions really exist, certainly these burrows of avarice and luxury would have penetrated into them."*

* Book XXXIII.

* Book II.

* 28:3, 9, 10, 11.

Job's tribute to the mining engineer of his day is more satisfying.* "He setteth an end to darkness, and searcheth out all perfection: the stones of darkness, and the shadow of death. He putteth forth his hand upon the rock; he overturneth the mountains by the roots. He cutteth out rivers among the rocks; and his eye seeth every precious thing. He bindeth the floods from overflowing; and *the thing that is hid* bringeth he forth to light."

King Athalaric, the Ostrogoth of the 6th century, was less impressed with the advantages of the life of a miner. "The work of a miner resembles that of a mole. He burrows underground, far from the light of day. Sometimes the sides of his passages fall in and his way

is closed up behind him, but if he emerges safely with his treasure, how happy is he.”*

The earliest description of India’s gem mining known to me is that of Eudoxus of Cyzicus,* who visited that country about 120 B.C., and states: “Some (precious stones) the Indians collect from amongst the pebbles of the river, others they dig out of the earth, where they have been formed by the moisture as crystals are formed with us.” Ctesias knew that Indian agates were washed down from the highlands, a statement repeated by Pliny* regarding Indian sardonyx.

Rock crystal, according to Pliny, in addition to being mined in place, is ploughed up in the soil in Spain (it is detrital) and is also recovered as river pebbles. That found in the Alps is “so difficult of access that it is usually found necessary to be suspended by ropes in order to extract it.” This statement is true, but the use of arrows in shooting down cinnabar in the Colchis,* a tale repeated from Theophrastus, and of slings in “mining” *callaina* (turquoise),* to say the least, could scarcely be standard methods of mining. It is, indeed, a typical gem dealer’s tale recounted to enhance the price of his goods.

Many precious stones are mined from shafts and occur in solid rock (gypsum);* specular stone (probably selenite);* and rock crystal; the emerald is sought “in the very bowles of the earth.”* Carnelian also was quarried.* Dionysius Periegetes (probably of the time of Augustus, at latest that of Trajan) knew that lapis lazuli, from the region approximating that of the present well-known Afghanistan locality, was extracted from the rock. To quote him:

*“On every side they view the teeming mines
Whence the azure slabs of sapphire* brought to light
With guerdon rich laborius hands requites.”**

Pliny did not know much regarding the Sinai Peninsula turquoise mines, where hard rock mining was begun at least as early as 3200 B.C. and was probably in progress to a minor degree in Pliny’s time.* While Pliny rather overemphasizes the occurrence of gems *in situ*, careful reading of the text shows that the ma-

* Letter, Athalaric to Bergantinus in *The Letters of Cassiodorus*, Thomas Hodgkin, London, 1886, p. 38.
* Strabo, Bohn’s Libraries, London, 1912, Vol. I, p. 149.

* Ch. 23.

* Book XXXIII, Ch. 37.

* Book XXXVII, Ch. 33.

* Book XXIV, Ch. 59.

* Book XXXVI, Ch. 45.

* Book XII, Ch. 1.

* Book XXXVII.

* Really lapis lazuli.

* C. W. King translation.

* E. & M. J., 1927, pp. 483-5.

Gem Mining in Pliny's Day

jority of the stones in his day were found in gravels. Regarding the sapphire and the green jasper, for instance, Naumachius* says:

*"Stones are they, scatter'd o'er the pebbly coast,
Or on the torrent's bank at random toss'd.*

Ovid states (43 B.C.-17 A.D.)* a witch uses in her incantations gems, among other things:

*"With gems in the eastern ocean's cell refined
And such as ebbing tides had left behind."**

Dionysius Periegetes also states that most of the Indian's gemstones are found as river pebbles. Of course, Pliny well knew that amber was thrown up by the waves on the Prussian coast. Other Latin writers emphasize the occurrence of amber in the ocean;* indeed, they rather overdo the association of gemstones and waves.* We quote the latter:

*"And precious stones shall 'mid the grass-wracke glare
Where Pontus' shores a smiling verdure bear."**

Again:

*"The cranes . . . pecked gems on Red Sea shore."**

In the *Minor Latin Poets* is an elegy of Maecenas (died 8 A.D.) and in it is the following: "even as the beryl surpasses the common sands which the wave tosses about along with it on a distant shore."

The Romans apparently recognized the association of minerals with one another and the value of certain rocks and minerals as indicators, for in describing gold, Pliny* states that chrysocolla (our malachite, in part our chrysocolla) occurs close to where gold is dug from the earth. He adds that the gold miner first removes the *segutilum*, an earth which indicates the presence of gold. He also knew that diamonds and gold in alluvial deposits were associated. Experienced Alpine crystal hunters were guided in their search by certain indications, and Pliny apparently believed that crystal occurs only in certain rocks.

Mining was carried on by both the government and private interests. According to Strabo, King Archelaus of Cappadocia employed his own prospectors, who were lucky enough to discover minerals of value.

* *Marriage Precepts*,
Vol. 58.

* *Metamorphoses*, Book
VII, lines 410-1.

* Tate translation.

* Claudian, *Epistle V to
Serena*, lines 11-2.

* Propertius, *Elegy VII
to Cynthia* and
Claudian.

* *Invective against
Rufinus*, lines 585-6.

* *Epistle II to Serena*,
line 14; also *Panegyric
of 6th consulship of
Honorius*.

* Book XXXIII.

Treated and False Stones

CHAPTER X

N Pliny's time, stones were treated to improve their appearance and the art of making paste imitations of gems advanced.

To paraphrase him: All precious stones are improved in brilliancy by being boiled in honey, Corsican honey in particular; acrid substances, however, are injurious to them. (If by "boiled" Pliny means heated, he had the secret of artificially coloring agate; if not, his informants were holding out an essential step in the process.) Such treated stones, to which man has imparted new colors, are called *physis* ("nature" or "works of nature"), a bit of deception, since dealers recognize that products of nature are more sought after than those of man.

The above free rendering may be a rather obscure reference to an art, which the Hindus even then doubtless practiced, of improving the color of varieties of the cryptocrystalline quartz species by exposure to the sun or to fire, after permitting the more porous layers to absorb honey or other liquids. It is, therefore, believed that the Romans knew something of agate staining. Barbosa (1517 A.D.) describes the art and it doubtless long antedated his time. Could the line in Propertius* (flourished 30 to 15 B.C.) regarding *murrha* (agate in part) "And *murrhine* vessels baked in Parthian hearths" refer to this process?

* Book IV, El. 5, 1:26.

* Book XXXVII, Ch. 51.

The *ceraunia*,* on the other hand, is temporarily improved by being treated for some time in a mixture of vinegar and nitre, and the brilliancy of poor garnets is heightened by steeping for fourteen days in vinegar,

Treated and False Stones

the improvement lasting an equal number of months.*

* Ch. 26.

Pliny states that books exist which tell how to counterfeit precious stones, but he "refuses to name" the authors, evidently to protect the owners of real gems. This reminds one of David Jeffries' lament (1750 A.D.) when the brilliant cut was supplanting the rose cut diamond, that, provided the "fad" continued, the nobility of England, being large possessors of rose cut diamonds, would be ruined. An earlier analogue is that of the Chinese ambassador, Kan Ying, who reached Antioch, the capital of Roman Syria, in 97 A.D. "The articles made of rare precious stones produced in this country are sham curiosities and mostly not genuine, whence they are not (here) mentioned."* Regarding gem counterfeiting, Pliny adds that there is no deceit practiced, which is more profitable.* He recognizes that the best method of testing a false stone is to break off a fragment and test its hardness, but the Roman jeweler would not permit this nor the use of the file.* In other words, Pliny recognized that hardness is one of the best of gemological tests.

* Hirth, *China and the Roman Orient*.

* Ch. 75.

* Ch. 76.

As happens today, less valuable stones were palmed off for the more valuable species, and Pliny states, as is the case today, this is a particularly difficult deception for the layman to detect.* Sardonyx was imitated by a triplet of a black, a white, and a red stone, each of excellent quality, cemented together. Martial (40-104 A.D.),* in describing a fine jewelry shop of his day, mentions "real" sardonyx, indicating that false exists. In Pliny's time, crystal was stained to imitate emerald and other transparent stones, and other frauds were perpetrated. The people of India, by coloring crystal, imitated various precious stones, particularly beryls.* Perhaps the process by which Democritus imitated emerald resembled that of the Indian crystal imposition. He discovered, Seneca says,* how a pebble can be transformed into an emerald by boiling it. By a similar process artificial gems are stained today. From the Hindu poem *Hitopedesa* (dating from about the time of Christ), we quote the following lines, more or less detached, to be sure:

* Ch. 75.

* Book IX, Epigram 59.

* Ch. 20.

* Ep. 90, 33.

A ROMAN BOOK ON PRECIOUS STONES

"Silly glass in splendid settings, something of the gold may gain:
And in company of wise ones, fools to wisdom may attain."

"Glass will glitter like the ruby, drilled with dust—are they the same?"

An ancient Hindu play *Mrichchhakatika* or *Little Clay Cart* (6th century A.D.), as to Hindu makers of false stones, says "they readily fabricate imitations of ornaments they have once seen, in such a manner that the difference shall scarcely be discernible."

Returning to Pliny, he says that any color can be imparted to amber that may be desired, it being sometimes stained with kid suet and root of orchanet; indeed, in his day, amber was even dyed purple. Much amber was used, he says, to counterfeit gems, especially amethyst. We may add that today pressed amber is successfully colored.*

* George C. Williamson, *The Book of Amber*, London, 1932. p. 338.

* Ch. 67.

* Ch. 37.

* Ch. 22.

* Ch. 33.

* Ch. 38.

The artisans of Pliny's time imitated many stones in glass and some of these false gems which have come down to us would test the skill of an expert of today. Certain Italian jewelers still, after recutting, sell as real gems the pastes dug up in Rome. Obsidian, *murrha*, crystal, and other stones were imitated.* Pliny states that glass imitations of jasper are easily detected* and as to the opal, it is the most perfectly imitated, although the opalescence is partly or largely lacking.* The *callaina* (turquoise)* is also successfully counterfeited. Genuine *capnias* is much colder than the glass imitations. *Carbunculus* (garnet and other red gems) is well counterfeited, but the glass imitation is softer, comparatively brittle) and lighter in weight. Further, the inclusions differ. The Egyptian *cyanos** is undoubtedly a blue frit, an imitation of turquoise.

The Egyptians and the citizens of Ur made glass imitations of gems some 5000 years ago. Later (1600-1400 B.C.) the Myceneans were adept at the trade. On the other hand, while there are a few Greek paste intaglios of the 4th century B.C., such were rare before the 3rd century B.C. Pastes were much used in Rome until some years after Pliny's time, when they became less common, probably because genuine precious stones were in larger supply. Glass in Pliny's time* furnished

* Book XXXV, Ch. 30.

Treated and False Stones

the poor, who could not afford gems, not only with the "costume" jewelry of that day, but with a necessary signet. Paste in those days was, from its decorative value, ranked nearer to precious stones than it is today, for the faceting of stones, which brings out the full beauty of the transparent gem, was then in its infancy. Further, in those days, glass was a much more scarce and precious substance than it is today, so that its use in jewelry was less culpable than today. Alexander Severus, in attempting to stamp out the luxury of Heliogabalus' reign, placed heavy taxes on the glass-makers. Diocletian (Emperor, 284-305 A.D.) decreed that all books describing the synthesis of gold and silver and the fabrication of artificial precious stones should be burned.

There is a thought-provoking statement in Horace,* namely, crystal vases "had been spoiled by an admixture of glass." The Romans, in the writer's opinion, could scarcely have melted rock crystal and glass together.

I think we can all smile with the Emperor Gallienus, who reigned from 260 to 268 A.D. A jeweler had sold Gallienus' wife, the Empress Salonina, false gems for true. She called the matter to the attention of the emperor and he immediately ordered the jeweler to be thrown to the wild beasts in the circus. Naked, the poor wretch stood in the arena awaiting his doom. The door of the wild beasts' den was thrown open; out strutted a rooster! The emperor's comment, "he who had cheated others should be cheated himself."* More militant punishment is recommended in the Hindu *Agastimata* (16th century), as follows: "The vile man who fabricates false diamonds will sink into an awful hell, charged with a crime equal to murder."*

One of the last parts of Book XXXVII is an excellent and, to all intents and purposes, a modern summary of the methods of testing gems. This has already been quoted in the section on Pliny as a mineralogist. In short, glass imitations are lighter, better conductors of heat, contain more gas inclusions, and are softer than gemstones.

* Book IX, Ep. 59.

* Trebellius Pollio, *Historiae Augustae Scriptores*, vita Gallieni, Ch. 12.

* B. Laufer, *The Diamond*, Field Museum, Chicago, 1915, p. 42.

Industrial Uses of Gems

CHAPTER XI

 FROM the beginning of time precious stones have been used industrially. To the man of the Stone Age, minerals served not only for some, and indeed most, of the purposes for which they are used today, but as well those for which we employ metals. From agate, chalcedony, and flint, the munition worker of that day fabricated arrowheads and spear points. The people of Ur of the Chaldees (3500-3200 B.C.) made hones of lapis lazuli. Rock crystal lenses, perhaps reading glasses, dating from presumably the 2nd millenium before Christ, were found at Nimrud near Baghdad and others dating from 1600-1200 B.C. in Crete. Rock crystal lenses were used in Greece in early times, according to an Orphic poem of perhaps 500 A.D., to kindle the temple fires. Further, according to the Taoist writer, Wang Ch'ung, there is evidence that the Chinese had lenses of precious stones 2000 years ago. Seneca* refers to the magnifying power of balls of glass or rock crystal.

* *Nat. Quaest.* I, VI, 5.

Almost 3000 years before Pliny's time, the Egyptians had an annular drill which cored rock, the precursor of our diamond drill. The abrasive used was presumably quartz or garnet sand.

* Book VII, Ch. 69.

Herodotus,* the Father of History, in describing Xerxes' army mentions the Aethiopians whose arrows were tipped with sharp stones "of that sort by which they engrave gems" (probably quartz, flint, or obsidian).

* Jeremiah 17:1.

The Jews* used as a graving tool a hard stone (probably emery, although translated "diamond" in the King

Industrial Uses of Gems

James' translation) set in a "pen of iron." Theophrastus* speaks of engraving signets in stones so hard that they cannot be cut by iron but must be cut by other stones. Sealstone cannot be cut with the whetstone though* it may be "composed of the same kind of matter with the whetstone."

* Art. 75.

* Art. 77.

The Hindus presumably by Pliny's time had recognized the diamond as the superabrasive. From the *lima*, or file, of the classical gem engraver (emery powder set in resin) his Hindu confrere may have gotten the idea of imbedding gem dust in shellac. In the past decade we have greatly improved the idea by imbedding diamond dust in a plastic, in powdered metal, or in a ceramic. The wide use of this compound for grinding wheels and other tools in World War II, speeded up our munitions program tremendously.

* Art. 79.

Theophrastus reports* that in his day the touchstone was used for testing gold. We have used it ever since.

Industrial uses of gems, however, even in Pliny's day were but little developed. Diamond splinters set in iron were used by gem engravers "to cut the very hardest substances known."* All stones, even the hardest, could be cut and polished by the *adamas* (diamond in part).* Diamonds were also used to bore holes in other stones.

* Ch. 15, Ch. 76.

* Ch. 76.

In *The Dynasty of Raghu*, Kalidasa, a great Hindu poet of the 5th Century of our era, sings:

*"Yet I may enter through the door
That mightier poets pierced of yore;
A thread may pierce a jewel, but
Must follow where the diamond cut."**

* For this reference I am indebted to Mrs. Lydamar H. Reese.

From this we know that at that time beads of precious stones were pierced in India with splinters of diamond. Indeed, the custom started years before, for one of the indications that a sardonyx or other gemstone was of Indian origin in Pliny's day was that it was pierced.

Agate mortars were used by medical men to powder drugs, as do our pharmacists of today.* Aristophanes (408 B.C.) mentions the druggist's stone mortars.* Ovid* (43 B.C.-17 A.D.) states that marble mortars were

* Ch. 54.

* *Plutus*, line 721.

* *de Medicamine Faciei*.

A ROMAN BOOK ON PRECIOUS STONES

* Book XXXVI, Ch. 66.

* Book XXI, Ch. 47.

* Ch. 10.

used to crush herbs. "The glass of India is made of broken crystal," hence its superiority:* specular stone (gypsum and in rare instances mica) are used for beehives "for the purpose of watching the bees at work within."* Balls of rock crystal were used by doctors to cauterize wounds,* also to cool hands in summer. Other medicinal virtues, real or mythical, are frequently noted by Pliny.

* Book XXXVI, Ch. 9.

* Ch. 76.

Marbles were cut into blocks by a saw fed with sand, that of Aethiopia being considered the best, and after it, the Indian. Of the two the latter is the harder, suggesting it may have been gem sands,* particularly as Pliny adds that it and the sands of Naxos (probably emery) are so hard that they leave a rough surface. Stones, including obsidian dust,* were used to test the hardness of gems.

Identification of Pliny's Precious Stones with Those of Our Day

CHAPTER XII

THE following tables are an attempt to correlate the stones described by Pliny with those of our day. In this attempt at identification I have used numerous clues; the result, "certain" determinations, "probable" determinations, and "possible" determinations of many of Pliny's gems. As to the identity of others, it is useless even to guess.

Table A gives the present equivalent of Latin names of precious stones: Table B gives the Latin equivalents of English names.

In the last third of Book XXXVII, Pliny describes gems of relatively small importance even in his time; various minerals of no beauty and, therefore, not precious stones from our viewpoint; a number of fossils and some vegetable and artificial products fabricated by skillful Oriental artisans. Others which are described probably never existed. This part of the book is indeed a comprehensive list of all those "gems" described in the books available to him which did not fit into the earlier chapters. These books cover the literature of centuries and it is probable that in such a long period the same stone was known by several names; other names doubtless represent but small variations of species elsewhere described.

A few precious stones known to have been used by the Romans I have not recognized among the species described by Pliny; for example, fluorspar (I believe, however, it was one of a number of substances from which *murrhine* cups were made) and bone turquoise described by Theophrastus.* The latter may well be

* Ch. 65.

A ROMAN BOOK ON PRECIOUS STONES

hidden among some of the various minerals believed by me to have been our turquoise. The Romans also used iolite, fuchsite, sillimanite and moldavite, but so rarely that they have been unknown to Pliny.

TABLE A
Table of Identification—Pliny's Gems and Minerals with
Their Modern Equivalents

Latin Name	Book	Ch.	Certain	Probable	Possible	Remarks
Lyncurium	VIII XXXVII	57 13		Reddish yellow Topaz or Tour- maline	Zircon	Strabo's name for Amber (Lingur- ium)
Ovum Anquinum	XXIX	12	Glass beads			
Caeruleum	XXXIII	57	Azurite			
Silex	XXXVI	49	Lava			
Lapis Armenius	XXXV	28	Azurite			
Chrysocolla (uva)	XXXIII	26	Malachite	In part Chrysocolla		
Chernites	XXXVI	28		Alabaster		
Gypsum	XXXVI	59	Gypsum			
Lapis Specularis	XXXVI	45	Mainly Selenite			
Phengites	XXXVI	59	In part mica			
	XXXVI	46		Translucent Marble or Alabaster		
Magnes, Sideritis and Heracium	XXXVI	25	Magnetite			Heracium stone of Theophrastus (X); is clearly Touch- stone
Haematitis	XXXVI XXXVI XXXIII XXXIII	37-8 25 21 43	Hematite			
Lydian Stone or Coticula	XXXVI	11	Basanite or Touchstone			
Ophites	XXXVI	11	Serpentine and Verd antique			
Basanites	XXXVI	11	Basalt			
Alabastrites	XXXVI	12	Onyx-marble largely; in part Alabaster Gypsum			
Lygdinus	XXXVI	13	Translucent Parmian Marble			Also called "Lych- mites" as it was quarried "by lamplight"*
Aetitis Lapis	XXXVI	39	Concretions			

Book XXXVI, Ch. 4.

TABLE A—Continued
 Table of Identification—Pliny's Gems and Minerals with
 Their Modern Equivalents

<i>Latin Name</i>	<i>Book</i>	<i>Ch.</i>	<i>Certain</i>	<i>Probable</i>	<i>Possible</i>	<i>Remarks</i>
Gagates	XXXVI	34	Jet			
Lapis Siphnos	XXXVI	44	Steatite			
Obsidianus	XXXVI	67	Obsidian			
	XXXVII	65				
	XXXVII	76				
Murrha	XXXVII	7-8				
			Collective name of material of "hard stone" vases cut in the East and in Rome, including Agate, Chalcedony, Jasper, Sard, and Sardonys and probably Fluorspar (Fluorspar was used by Romans and softness of some vases and their "perfume" suggests Fluorspar.)			
Crystallus	XXXVII	9-10	Rock Crystal			
Aconteta	XXXVII	10	Pure well crystallized Rock Crystal			
Succinum	XXXVII	11-12	Amber			
(Greek Electrum)						
Chryseletrum	XXXVII	12	Yellow Amber			
Chalcantum	XXXIV	27	Chalcanthite			
	XXXIV	32				
Adamas:	XXXVII	15	In part Diamond			Also probably included colorless Sapphire and other colorless stones
(1) Indian	XXXVII	15	Diamond			Indian stones arriving via Arabian trade
(2) Arabian	XXXVII	15		Diamond		
(3) Cenchros	XXXVII	15				
(4) Macedonian	XXXVII	15		Diamond Rock Crystal		
(5) Cyprian	XXXVII	15	Rock Crystal	"Diamond" of Baffa		Like "Bristol" "Alaskan" Diamond of present day Diamond and Magnetite confused from early Grecian times through Middle Ages
(6) Siderites	XXXVII	15	Magnetite			

Identification of Pliny's Precious Stones with Today's

TABLE A—Continued
Table of Identification—Pliny's Gems and Minerals with
Their Modern Equivalents

Latin Name	Book	Ch.	Certain	Probable	Possible	Remarks
Smaragdus:	XXXVII XXXVII	3 16-18	In part Emerald			Includes other green gems; the "Em- eralds" of Co- logne Cathedral proved to be Peri- dots
(1) Scythian	XXXVII	16-18		Green Sapphire Emerald		
(2) Bactrian	XXXVII	16-18				
(3) Egyptian	XXXVII	16-18	Emerald			
(4) Cyprian	XXXVII	16-18		Chrysocolla, or Malachite in part	Copper stained Quartz	
(5) Ethiopian	XXXVII	16-18	Emerald		Green turquoise	
(6) Hermionian or Persian	XXXVII	16-18				
(7) Attican	XXXVII	16-18		Smithsonite	Turquoise	
(8) Median	XXXVII	16-18		Malachite with in- tergrown Azurite		
(9) Chalcedonian Sarcicon	XXXVII	16-18		Bornite, a copper sulphide; also called "Peacock Ore"		
(10) Cloras	XXXVII	16-18	Green Alabaster			
Tanos	XXXVII	19				
Chalcosmaragdus	XXXVII	19		Green Turquoise Malachite with sul- phite stringers		
Pseudo-smaragdus	XXXVII	19		Jasper and Mala- chite joined in a single stone		
Beryllus:	XXXVII	20	Beryl, etc.			
(1) Pure sea green	XXXVII	20	Aquamarine			
(2) Chrysoberyllus	XXXVII	20	Golden Beryl			
(3) Chrysoprasos	XXXVII	20		Chrysoprase	In part green Beryl	
(4) Hyacinthi- zontes	XXXVII	20	Deep blue Beryl			
(5) Aeroides	XXXVII	20	Pale blue Beryl			

TABLE A—Continued
 Table of Identification—Pliny's Gems and Minerals with
 Their Modern Equivalents

<i>Latin Name</i>	<i>Book</i>	<i>Ch.</i>	<i>Certain</i>	<i>Probable</i>	<i>Possible</i>	<i>Remarks</i>
(6) Other varieties	XXXVII	20	Common Beryl			
Opalus	XXXVII	21	Opal			
Paederos	XXXVII	22	Opal			
	XXXVII	46				
	XXXVII	22	Opal			
Sardonychus	XXXVII	23	Sardonyx			
	XXXVII	2				
Onychus	XXXVII	24	Onyx		Agate in part	Other classical writers used name for Alabaster. Includes our Eye-Agate, Chalcedony - onyx, Carnelian - onyx, and banded Agate.
Sangenon						
Carbunculus:	XXXVII	25-26	Usually Garnet, also Ruby	Ruby, and red Spinel, other transparent red gems.		
(1) Apyroti	XXXVII	25-26	Ruby			
(2) Indian	XXXVII	25-26	Almandite			
(3) Garamantic or Carchedonian	XXXVII	25-26	Garnet	Star Garnet		
(male)	XXXVII	25-26				
(4) Aethiopian	XXXVII	25-26	Garnet			
(5) Alabandic	XXXVII	25-26	Almandite	Almandite, Spinel		
(6) Amethystizotes	XXXVII	25-26				
(7) Syrtitae	XXXVII	25	Garnet			
Anthracitis	XXXVII	27	Garnet largely	Some Ruby included		
	XXXVII	73				
Sandastros or Garamantites	XXXVII	28	Aventurine Quartz			
Sandastros	XXXVII	28			Aventurine Feldspar	
Ismenias variety						
Sandaserion	XXXVII	28		Green Aventurine Quartz	In part, green Jasper	

TABLE A—Continued
Table of Identification—Pliny's Gems and Minerals with
Their Modern Equivalents

Latin Name	Book	Ch.	Certain	Probable	Possible	Remarks
Lychnis	XXXVII	29		Red Tourmaline	Reddish yellow Quartz	
Ionis	XXXVII	29			Amethyst	
Carchedonia	XXXVII	30		Garnet	Theban variety may be veined red Jasper	
Sarda	XXXVII	31	Largely Carnelian, in part Sard			
Topazos:	XXXVII	23				
Prasoides	XXXVII	24				
Chrysopteron	XXXVII	32	Olivine			
Callaina	XXXVII	32	Peridot			
Prasius	XXXVII	33	Green Turquoise			
Prasius with red spots	XXXVII	34	Plasma or Prase			
Prasius with white streaks	XXXVII	34	Bloodstone or Heliotrope			
Chrysoprasius	XXXVII	34	Banded green			
Nillion	XXXVII	35	Chalcedony			
Molochitis	XXXVII	36				
Jaspis:	XXXVII	37	Malachite Jasper, predominantly the green variety	Chrysoprase Green Jasper or Plasma		
Indian	XXXVII	37	Green Jasper; in part Jade			
Aerizusa or Boria	XXXVII	37	Sapphirine variety of Chalcedony			
Sphragis	XXXVII	37	Ordinary Jasper			
Terebenthine colored	XXXVII	37	Yellowish Jasper of several bands			
Monogrammos and Polygrammos	XXXVII	37	Striped Jasper			
Jasponyx	XXXVII	37	Jasper and Onyx interbanded			

TABLE A—Continued
*Table of Identification—Pliny's Gems and Minerals with
 Their Modern Equivalents*

<i>Latin Name</i>	<i>Book</i>	<i>Ch.</i>	<i>Certain</i>	<i>Probable</i>	<i>Possible</i>	<i>Remarks</i>
Capnias	XXXXVII	37	Brownish Jasper			
Cyanos	XXXXVII	38	Azurite			
Cyanos, artificial	XXXXVII	38	Blue Frit			
Sapphiros	XXXXVII	39	Lapis Lazuli			
Amethystos:	XXXXVII	40	Amethyst			
Indian	XXXXVII	40	Amethyst	In part purple Sapphire		
Saccondion	XXXXVII	40	Amethyst	Amethyst		
Sapenos or	XXXXVII	40	Amethyst			
Pharanites:						
Inferior variety of	XXXXVII	40	Amethyst of poor quality			
Amethysto	XXXXVII	40		Amethyst		
Paederos, Anterotes	XXXXVII	40		Amethyst		
or Veneris Gena	XXXXVII	41				
Hyacinthos	XXXXVII	42	Sapphire Topaz			
Chrysolithos	XXXXVII	42				
Chryselectrum	XXXXVII	43	Citrine			Doubtless (particu- larly Indian) includes yellow Sapphire, Jacinth, yellow Garnet, and Citrine In Ch. 12 same name used for a variety of Amber
Leucochrysos	XXXXVII	44			Inferior Topaz	
	XXXXVII	62				
Capnias	XXXXVII	44	Smoky Quartz			
Melichrysos	XXXXVII	45	Chrysoberyl Cat's-eye			
Xuthon	XXXXVII	45				
				Yellow Jasper		See above Ch. 37
Paederos	XXXXVII	46	Precious Opal			Ch. 60 spelled
Argenon	XXXXVII	46	Precious Opal			"Xanthos." See
Senites	XXXXVII	46	Inferior Opal			Theophrastus Ch. 66

TABLE A—Continued

*Table of Identification—Pliny's Gems and Minerals with
Their Modern Equivalents*

<i>Latin Name</i>	<i>Book</i>	<i>Ch.</i>	<i>Certain</i>	<i>Probable</i>	<i>Possible</i>	<i>Remarks</i>
Asteria, India	XXXXVII	47	Star Sapphire			
Asteria, Carmania	XXXXVII	47		Girasol Opal Moonstone		
Astrion	XXXXVII	48				
Astroites	XXXXVII	49	Fossil Coral			
Astrobolos	XXXXVII	50		Quartz Cat's-eye or Moonstone		Based on De Boot's illustration "Fish-eye," a former name for Moonstone
Ceraunia	XXXXVII	48		Inferior Moonstone	Satinspar	
Ceraunia, Sotacus varieties	XXXXVII	51				
	XXXXVII	51	Prehistoric axes			
Ceraunia, Parthian	XXXXVII	51	Prehistoric axes or arrowheads			
Ceraunia, Betuli	XXXXVII	51	Meteorite			
Iris	XXXXVII	52	Iris			
Iritis	XXXXVII	52				
Leros	XXXXVII	53		Iris		
Achates:						
(1) Iaspisachates	XXXXVII	54	A variety of crystallized Quartz			
(2) Cerachates	XXXXVII	54	Agate			
(3) Smaragdachates	XXXXVII	54	Agate-jasper			
	XXXXVII	54	Chalcedony			
	XXXXVII	54	Green Agate			
(4) Haemachates	XXXXVII	54	Red Agate or Agate with red Jasper veins or spots			
(5) Leucachates	XXXXVII	54	Chalcedony			
(6) Dendrachates	XXXXVII	54	Moss Agate			
(7) Coralloachates	XXXXVII	54		A red Agate		A silicified fossil Coral
(8) Indian varieties	XXXXVII	56				
	XXXXVII	54	Moss Agate			

TABLE A—Continued
Table of Identification—Pliny's Gems and Minerals with
Their Modern Equivalents

<i>Latin Name</i>	<i>Book</i>	<i>Ch.</i>	<i>Certain</i>	<i>Probable</i>	<i>Possible</i>	<i>Remarks</i>
Alabastrites	XXXXVII	54	Alabaster			
Alectoriae	XXXXVII	54	A pebble or crystal swallowed by hen or its calculi			
Androdamos	XXXXVII	54		Galena	Specular Hematite Talc	
Argyrodamos	XXXXVII	54				De Boot's identifica- tion
Arabica	XXXXVII	54				
Aromatites	XXXXVI	41				
Asbestos	XXXXVII	54	Chalcedony	Ambergris		
Antipathes	XXXXVII	54	Asbestos		Jet	
Aspisatis, first variety	XXXXVII	54		Garnet		
Atizoe	XXXXVII	54			Bezoar	
Augites	XXXXVII	54			Turquoise	
Amphitane	XXXXVII	54		Chrysocolla or Malachite with sulphide residuals unaltered or auriferous Pyrite		
				Coal		
Apseutos	XXXXVII	54				
Aegyptilla	XXXXVII	54	Nicolo			
Balanites	XXXXVII	55				
Beliculus	XXXXVII	55				
Baptes	XXXXVII	55	Stained Amber	Quartz Cat's-eye	Fossil: Pentremite Eye-Agate	
Botrytis	XXXXVII	55		Botryoidal Hema- tite		
				Cast of fossil bi- valve		
Bucardia	XXXXVII	55		Prehistoric stone arrowheads		
Brontea	XXXXVII	55				"Elf-darts" of folk- lore; suggested by shape and supposed associa- tion with light- ning

TABLE A—Continued

Table of Identification—Pliny's Gems and Minerals with
Their Modern Equivalents

Latin Name	Book	Ch.	Certain	Probable	Possible	Remarks
Callais	XXXVII	56	Blue Turquoise			
Cadmitis	XXXVII	56	Flint			
Capnitis	XXXVII	56		Smoke colored Jasper		See Capnias, Ch. 37
Callainae	XXXVII	56		Turquoise matrix		
Catocinites	XXXVII	56		Bitumen		
Catopyrites	XXXVII	56				Selenite White Agate
Cepitis or Cepocapites	XXXVII	56				Siliceous Kaolin
Ceramites	XXXVII	56				Asbestos
Corsoides	XXXVII	56				In part Zircon
Crateris	XXXVII	56		Yellow Sapphire		Garnet
Crocallis	XXXVII	56				Concretion
Cytis	XXXVII	56				
Calcophonos	XXXVII	56	Basalt			
Chelidonia	XXXVII	56	Calculus of swallow			
Chloritos	XXXVII	56				
Choasptis	XXXVII	56				Calculus of wag- tail Partially oxidized Copper ore
Chrysolampus	XXXVII	56	Peridot			
Chrysopsis	XXXVII	56		Pyrite		
Ceponides	XXXVII	56		Obsidian		Beryl
Diadochus	XXXVII	57		Garnet		Fossil shell
Draconitis	XXXVII	57				
Encardia or Cardiscae	XXXVII	58	Concretion or cast of fossil shell			
Enorchis	XXXVII	58				
Exhebenus	XXXVII	58		Chalcedony		Chalcedony
Eumeces	XXXVII	58				
Eumetres	XXXVII	58	Amazon stone			
(Gem of Belus)						
Eupetalos	XXXVII	58				A banded Agate

TABLE A—Continued
*Table of Identification—Pliny's Gems and Minerals with
 Their Modern Equivalents*

<i>Latin Name</i>	<i>Book</i>	<i>Ch.</i>	<i>Certain</i>	<i>Probable</i>	<i>Possible</i>	<i>Remarks</i>
Eureos	XXXVII	58	Fossil: Echinus or Pentremite			
Galaxias	XXXVII	59				Iron-stained Chalk or Limestone
Galactitis, etc. Gassidanes	XXXVII XXXVII	59 59		Chalk or Limestone	A concretion	
Glossopetra	XXXVII	59	Fossil shark teeth		In Middle Ages Arrowheads some times so called	
Gorgonia	XXXVII	59	Coral			
Heliotropium	XXXVII	60	Bloodstone			
Hephaestitis	XXXVII	60		Pyrite	Rock Crystal, Garnet	
Hexecontalithos	XXXVII	60		Iris	Opal	
Hieracitis	XXXVII	60			Jasper	
Hammitis	XXXVII	60			Oolitic Limestone, silicified	
Hammonis Cornu	XXXVII	60	Ammonite: A fossil shell			
Haematitis	XXXVII	60		Hematite		
Hennui or Xanthos	XXXVII	60		Yellow Jasper	Blood red Jasper	
Idaei-Dactyli	XXXVII	61	Belemnite			
Icterias	XXXVII	61	In part Limonite			
Jovis Gemma	XXXVII	61		Meerschmum		Eski-Shehir (Tur- key) deposit prob- ably worked 2000 years ago
Ion	XXXVII	61				Violet Andalusite, or Apatite
Lepidotis	XXXVII	62				
Leucophthalmos	XXXVII	62		Eye Agate	A Mica aggregate	
Leucopetalos	XXXVII	62				St. Stephen's stone
Libanochrus	XXXVII	62		Rock candy		

Identification of Pliny's Precious Stones with Today's

TABLE A—Continued
Table of Identification—Pliny's Gems and Minerals with
Their Modern Equivalents

<i>Latin Name</i>	<i>Book</i>	<i>Ch.</i>	<i>Certain</i>	<i>Probable</i>	<i>Possible</i>	<i>Remarks</i>
Limoniatis	XXXVII	62				
Lysimachos	XXXVII	62			Marble with Pyrite veinlets or gold Quartz	
Leucochrysos	XXXVII XXXVII	62 44	Inferior Topaz			
Medea	XXXVII	63	Alum slate		Opal	
Mixtrax	XXXVII	63			Alum	
Merocetes	XXXVII	63				
Mormonion or Pramnion	XXXVII	63	Deeply colored smoky Quartz			
Myrismitis	XXXVII	63			Amber	
Nasamonitis	XXXVII	64			Banded Jasper	
Nebritis	XXXVII	64			Banded Jasper	
Nympharena	XXXVII	64	Fossil teeth			
Ombria or Notia	XXXVII	65	Meteorite or pre- historic stone axes			In the Middle Ages sea urchins so named
Oritis or Siderites	XXXVII	65		Mammillary Magnetite		
Ostracias or Ostracitis	XXXVII	65		Flint		
Obsidianus	XXXVII	65	Obsidian			
Panchrus	XXXVII	66			Hindu Panchratna (a Hindu jewel set with several gems) Colorless Topaz	
Pangonius	XXXVII	66				Apparently refers to old myth of con- ception by swal- lowing a stone
Paneros or Pansebaston	XXXVII	66				
Pontica	XXXVII	66			Several varieties of Agate, including Moss Agate	

TABLE A—Continued
*Table of Identification—Pliny's Gems and Minerals with
 Their Modern Equivalents*

<i>Latin Name</i>	<i>Book</i>	<i>Ch.</i>	<i>Certain</i>	<i>Probable</i>	<i>Possible</i>	<i>Remarks</i>
Phloginos or Chrystes	XXXVII	66		Red Ochre		
Phoenicitis	XXXVII	66	Pentremite		Rock Crystal	
Paeanitis or Gemonides	XXXVII	66				
Solis Gemma	XXXVII	67	Barnacles		Moonstone	
Sagda	XXXVII	67				
Samothracia	XXXVII	67		Lignite or Jet		
Sauritis	XXXVII	67		Selenite	Sard	
Selenitis	XXXVII	67		Magnetite		
Siderites	XXXVII	67				
Sideropoecilos	XXXVII	67				
Spongitis	XXXVII	67			A variety of Magnetite	
Syrtitis	XXXVII	67			Pumice	
Syringitis	XXXVII	67			Bronzite	
Telirrhizos	XXXVII	68	Inferior Amethyst		Fulgurite	
Thracia	XXXVII	68			Jasper	
Tecolithos	XXXVII	68	Pentremite; Fossil			
Veneris Crines	XXXVII	69		Gray Tufa	Rutilated Quartz	Large quarries at Veii furnished Rome with a much used build- ing stone
Veientana	XXXVII	69				
Zmilaces	XXXVII	70			Green Alabaster	
Steatilis	XXXVII	71		Steatite		
Triophthalmos	XXXVII	71	Eye Agate		Hematite	Hepatitis* is Hematite
Hepatitis	XXXVII	71			Jade	
Adadunephros	XXXVII	71			Eye Agate	
Aegophthalmos	XXXVII	72			Eye Agate	
Hyophthalmos	XXXVII	72				
Aetites	XXXVII	72	Concretion			
Myrmerites	XXXVII	72	Amber with ant entrapped			

TABLE A—Continued

<i>Latin Name</i>	<i>Book</i>	<i>Ch.</i>	<i>Certain</i>	<i>Probable</i>	<i>Possible</i>	<i>Remarks</i>
Cantharias	XXXXVII	72	Amber with beetle entrapped			
Lycophthalmos	XXXXVII	72			Concentric Agate geode	
Hammochrysos	XXXXVII	73	Scales of iron-stained Mica schist			
Dryitis	XXXXVII	73	Lignite	Artificial compound		
Narcissitis	XXXXVII	73		Moss Agate		
Gissitis	XXXXVII	73				
Cyamea	XXXXVII	73		Rock Crystal or Diamond	Concretion	Description suggests ballas type of Diamond; however, probably not known in Pliny's time
Chalazias	XXXXVII	73				
Pyren	XXXXVII	73		Pentrenite	Onyx	
Polyzonos	XXXXVII	73	Enhydros			
Enhygros	XXXXVII	73			Rutilated Quartz	
Polytrix	XXXXVII	73	Brownish yellow Jasper			
Leontios	XXXXVII	73	Spotted Jasper		Copper sulphate	
Pardalios	XXXXVII	73				
Chalcitis	XXXXVII	73				
	XXXXIV	2				
	XXXXIV	29				
Barsycite	XXXXVII	55				
	XXXXVII	73				
Gemites	XXXXVII	73	Lusus Naturae			
Dentritis	XXXXVII	73		Moss Agate		
	XXXXVII	73				
Cochlides	XXXXVII	74	Shell ornaments			

Identification of Pliny's Precious Stones with Today's

TABLE B

Gemstones, Minerals, and Substances with Pliny's Name

<i>English Name</i>	<i>Latin Name</i>	<i>Certain</i>	<i>Probable</i>	<i>Possible</i>
Agate	Murrha	In part		
Agate	Onychus			Yes in part
Agate	Achates	Yes		
Agate, several varieties	Pontica			Yes
Agate, banded	Eupetalos			Yes
Agate, eye	Leucophthalmos		Yes	
Agate, eye	Triophthalmos	Yes		
Agate, eye	Aegophthalmos			Yes
Agate, eye	Beliculus			Yes
Agate, eye	Hyophthalmos			Yes
Agate, geode	Lycophthalmos			Yes
Agate, green	Smaragdachates	Yes		
Agate-jasper	Iaspisachates	Yes		
Agate, moss	Dendrachates	Yes		
Agate, moss	Cissitis		Yes	
Agate, moss	Dentritis		Yes	
Agate, moss	Achates, Indian varieties	Yes		
Agate, red	Haemachates	Yes		
Agate, red	Coralloachates		Yes	
Agate, white	Cepitis or Cepocapites			Yes
Alabaster	Alabastrites	Yes		
Alabaster	Chernites		Yes	
Alabaster	Phengites		Yes	
Alabaster, green	Cloras	Yes		
Alabaster, green	Zmilaces			Yes
Almandite Garnet	Carbunculus, Indian	Yes		
Almandite Garnet	Carbunculus, Alabandic	Yes		
Almandite Garnet	Carbunculus, amethyst colored		Yes	
Alum	Meroctes			Yes
Alum slate	Medea	Yes		
Amazon stone	Eumetres	Yes		
Amber	Succinum	Yes		
Amber	Myrismitis			Yes
Amber, yellow	Chryselectrum	Yes		
Amber with fossil ant	Myrmerites	Yes		
Amber with fossil beetle	Cantharias	Yes		
Amber, stained	Baptas	Yes		
Ambergris	Aromatites		Yes	
Amethyst	Amethystos, Indian	Yes		
Amethyst	Sacondion	Yes		
Amethyst	Sapenos or Pharantites		Yes	
Amethyst, poor quality	Amethystos, Pliny mentions an inferior sort	Yes		
Amethyst, poor quality	Telirrhizos	Yes		
Amethyst	Paederos, Anterotes, Veneris Gena		Yes	

A ROMAN BOOK ON PRECIOUS STONES

TABLE B—(Continued)

Gemstones, Minerals, and Substances with Pliny's Name

English Name	Latin Name	Certain	Probable	Possible
Amethyst	Ionis			Yes
Ammonite	Hammonis Cornu	Yes		
Andalusite, violet	Ion			Yes
Apatite, violet	Ion			Yes
Aquamarine	Beryllus-color, pure green of the sea	Yes		
Artificial compound	Narcissitis		Yes	
Asbestos	Asbestos	Yes		
Asbestos	Corsoides			Yes
Aventurine Quartz	Sandastros or Gara- mantites	Yes		
Aventurine Quartz, green	Sandaserion		Yes	
Aventurine Feldspar	Sandastros			Yes
Azurite	Cyanos	Yes		
Azurite	Caeruleum	Yes		
Azurite	Lapis Armenius	Yes		
Barnacles	Sagda	Yes		
Basalt	Calcophonos	Yes		
Belemnite	Idaei-Dactyli	Yes		
Beryl	Beryllus	Yes		
Beryl, aquamarine	Beryllus, green of sea	Yes		
Beryl, golden	Chrysoberyllus	Yes		
Beryl	Chrysoprasos			In part
Beryl	Diadochus			Yes
Beryl, deep blue	Hyacinthizontes	Yes		
Beryl, pale blue	Aeroides	Yes		
Beryl, common	Beryllus, wax, oily, and crystal-like	Yes		
Bezoar	Atizoe			Yes
Bitumen	Catochites		Yes	
Bloodstone	Prasius with red spots	Yes		
Bloodstone	Heliotropium	Yes		
Bornite	Smaragdus, Chalcedonian		Yes	
Bronzite	Syrtitis			Yes
Calculus of chicken	Alectoriae	Yes		
Calculus of swallow	Chelidonia	Yes		
Calculus of wagtail	Chloritos			Yes
Carnelian	Sarda	Yes		
Carnelian-onyx	Onychus	Yes		
Cat's-eye, Chryso- beryl	Melichrysos	Yes		
Cat's-eye, Quartz	Astrobolos		Yes	
Cat's-eye, Quartz	Belioculus		Yes	
Chalcedony	Murrha	In part		
Chalcedony	Cerachates	Yes		
Chalcedony	Leucachates	Yes		
Chalcedony	Arabica	Yes		
Chalcedony	Exhebenus		Yes	
Chalcedony	Eumeces			Yes
Chalcedony, green banded	Prasius with white streaks	Yes		

Identification of Pliny's Precious Stones with Today's

TABLE B—(Continued)

Gemstones, Minerals, and Substances with Pliny's Name

<i>English Name</i>	<i>Latin Name</i>	<i>Certain</i>	<i>Probable</i>	<i>Possible</i>
Chalcedony, Sapphirine variety	Aerizusa or Boria	Yes		
Chalcedony-onyx	Onychus	Yes		
Chalk, iron-stained	Galaxias			Yes
Chalk or limestone	Galactitis		Yes	
Chrysoberyl, Cat's-eye	Melichrysos	Yes		
Chrysocolla	Smaragdus, Cyprian		In part	
Chrysocolla	Chrysocolla		In part	
Chrysocolla, with sulphide residuals	Amphitane		Yes	
Chrysolite, Olivine	Chrysopteron	Yes		
Chrysoprase	Chrysoprasius		Yes	
Citrine	Chryselectrum	Yes		Variety from Pontus
Coal	Apsyctos		Yes	
Concretion	Cyitis			Yes
Concretion	Aetitis Lapis	Yes		
Concretion	Gassidanes			Yes
Concretion	Enorchis	Yes		
Concretion	Cyamea			Yes
Copper sulphide partially oxidized	Choaspitis			Yes
Copper sulphate	Chalcitis			In part
Coral	Gorgonia	Yes		
Coral, fossil	Astroites	Yes		
Coral, fossil silicified	Coralloachates			Yes
Diamond	Adamas from India	Yes		
Diamond	Adamas from Arabia (trade route)		Yes	
Diamond	Cenchros		Yes	
Diamond	Chalazias		Yes	
Echinus, fossil	Eureos	Yes		
Emerald	Smaragdus	In part		
Emerald	Smaragdus, Bactrian		Yes	
Emerald	Smaragdus, Egyptian	Yes		
Emerald	Smaragdus, Aethiopian	Yes		
Emerald	Limoniatis		Yes	
Enhydros	Enhygros	Yes		
Flint	Cadmitis	Yes		
Flint	Ostracias or Ostracitis		Yes	
Fluorspar	Murrha		In part	
Frit, blue	Cyanos, artificial	Yes		
Fulgurite	Syringitis			Yes
Galena	Androdamos		Yes	
Garnet, Almandite	Carbunculus	Yes		
Garnet, Almandite	Carbunculus, Alabandic	Yes		

A ROMAN BOOK ON PRECIOUS STONES

TABLE B—(Continued)

Gemstones, Minerals, and Substances with Pliny's Name

English Name	Latin Name	Certain	Probable	Possible
Garnet, Almandite	Carbunculus amethyst colored		Yes	
Garnet	Carbunculus	Yes		
Garnet	Carbunculus, Garamantic or Carchedonian	Yes		
Garnet, Star	Carbunculus, Male Carchedonian		Yes	
Garnet	Carbunculus, Aethiopian	Yes		
Garnet	Syrtitae	Yes		
Garnet	Anthracitis	In part		
Garnet	Carchedonia		Yes	
Garnet	Aspisatis (first variety)		Yes	
Garnet	Crocallis			Yes
Garnet	Draconitis		Yes	
Garnet	Hephaestitis			Yes
Girasol Opal	Asteria, Carmania		Yes	
Glass beads	Ovum anquinum	Yes		
Gold Quartz	Lysimachos			Yes
Heliotrope (see Bloodstone)				
Hematite	Haematitis		Yes	
Hematite	Hepatitis			Yes
Hematite, Botryoidal	Botryitis		Yes	
Hematite, Specular	Androdamos			Yes
Iris	Iris	Yes		
Iris	Hexecontalithos		Yes	
Iris	Iritis		Yes	
Jade	Jaspis, green	In part		
Jade	Adadunephros			Yes
Jasper	Murrha	In part		
Jasper and Malachite intergrown	Pseudo-smaragdus		Yes	
Jasper	Jaspis	Yes		
Jasper	Sphragis	Yes		
Jasper	Hieracitis			Yes
Jasper	Thracia			Yes
Jasper, banded	Nasamonitis			Yes
Jasper, black veined	Barsycite			Yes
Jasper, brown	Capnias	Yes		
Jasper, green	Nilion		Yes	
Jasper, green	Jaspis, green	Yes		
Jasper, green	Sandaserion			In part
Jasper, red veined	Carchedonia, The- ban variety			Yes
Jasper, red	Haematitis			Yes
Jasper, smoke-colored	Capnitis		Yes	
Jasper, striped	Monogrammos and Polygrammos	Yes		
Jasper, striped	Nebritis			Yes
Jasper, spotted	Pardalios	Yes		
Jasper, yellow	Leontios	Yes		
Jasper, yellow	Henui or Xanthos		Yes	

Identification of Pliny's Precious Stones with Today's

TABLE B—(Continued)

Gemstones, Minerals, and Substances with Pliny's Name

<i>English Name</i>	<i>Latin Name</i>	<i>Certain</i>	<i>Probable</i>	<i>Possible</i>
Jasper, yellow	Xuthon		Yes	
Jasper, yellow banded	Jaspis, terebenthine colored	Yes		
Jasper, onyx-inter-layered	Jasponyx	Yes		
Jet	Gagates	Yes		
Jet	Samothracia		Yes	
Jet	Antipathes			Yes
Kaolin, siliceous	Ceramites			Yes
Lapis Lazuli	Sapphiros	Yes		
Lava	Silex	Yes		
Lignite	Dryitis	Yes		
Lignite	Samothracia		Yes	
Limonite	Icterias	In part		
Lusus Naturae	Gemites		Yes	
Magnetite	Heraclion		Yes	
Magnetite	Oritis or Siderites	Yes		
Magnetite	Magnes	Yes		
Magnetite	Siderites		Yes	
Magnetite, a variety	Sideropoecilos			Yes
Malachite	Molochitis	Yes		
Malachite	Chrysocolla (uva)	Yes		
Malachite	Smaragdus, Cyprian		In part	
Malachite intergrown with Azurite	Smaragdus, Median		Yes	
Malachite and Jasper joined in a single stone	Pseudo-smaragdus		Yes	
Malachite with unaltered sulphite stringers	Chalcosmaragdus		Yes	
Malachite with residual sulphide	Amphitane		Yes	
Marble with Pyrite veinlets	Lysimachos			Yes
Marble, Tree	Dentritis			Yes
Meerschäum	Jovis Gemma		Yes	
Meteorite	Betuli	Yes		
Meteorite	Ombria or Notia	Yes		
Mica	Lapis Specularis	In part		
Mica aggregate	Lepidotis			Yes
Scales of mica schist, iron-stained	Hammochrysos	Yes		
Moonstone	Astrion		Yes	
Moonstone	Astrobolos		Yes	
Moonstone, inferior	Ceraunia		Yes	
Moonstone	Solis Gemma			Yes
Moss Agate (see Agate, moss)				
Nicolo	Aegyptilla	Yes		
Obsidian	Ceponides		Yes	
Obsidian	Obsidianus	Yes		
Ochre, red	Phloginos or Chrystes		Yes	
Olivine, Peridot	Topazos	Yes		
Onyx	Onychus	Yes		

A ROMAN BOOK ON PRECIOUS STONES

TABLE B—(Continued)

Gemstones, Minerals, and Substances with Pliny's Name

English Name	Latin Name	Certain	Probable	Possible
Onyx	Polyzonos			Yes
Oolitic Limestone	Hammitis			Yes
Opal	Opalus	Yes		
Opal	Paederos	Yes		
Opal	Argenon	Yes		
Opal	Hexecontalithos			Yes
Opal	Mixtrax			Yes
Opal	Sangenon	Yes		
Opal, inferior	Senites	Yes		
Panchratna	Panchrus			Yes
Pentremite	Balanites			Yes
Pentremite	Phoenicitis	Yes		
Pentremite	Tecolithos	Yes		
Pentremite	Pyren		Yes	
Peridot	Prasoides	Yes		
Peridot	Chrysolampus	Yes		
Plasma	Nilion		Yes	
Plasma	Prasius	Yes		
Plasma with red spots, Bloodstone	Heliotropium	Yes		
Prase	Prasius	Yes		
Prehistoric arrow points	Brontea		Yes	
Prehistoric axheads	Cerauniae of Parthian	Yes		
Prehistoric axheads	Cerauniae of Sotacus	Yes		
Prehistoric axheads	Ombria or Notia	Yes		
Prehistoric axheads	Dentritis			Yes
Pumice	Spongitis			Yes
Pyrite	Chrysopis		Yes	
Pyrite	Hephaestitis		Yes	
Quartz, copper-stained	Smaragdus, Cyprian			Yes
Quartz	Leros	Yes		
Quartz, reddish yellow	Lychnis		Yes	
Rock candy	Libanochrus			
Rock crystal	Crystallus	Yes		
Rock crystal, flawless	Aconteta	Yes		
Rock crystal	Adamas, Macedonian variety		Yes	
Rock crystal	Adamas, Cyprian	Yes		
Rock crystal	Paeantitis or Gemonides			Yes
Rock crystal	Chalazias		Yes	
Rock crystal	Hephaestitis			Yes
Opal	Sangenon	Yes		
Ruby	Carbunculus	In part		
Ruby	Apyroti	Yes		
Ruby	Anthractis		In part	
Rutilated Quartz	Veneris Crines			Yes
Rutilated Quartz	Polytrix			Yes
Sapphire	Hyacinthos	Yes		
Sapphire, green	Smaragdus, Scythian		Yes	
Sapphire, purple	Amethystos, India		In part	

Identification of Pliny's Precious Stones with Today's

TABLE B—(Continued)

Gemstones, Minerals, and Substances with Pliny's Name

<i>English Name</i>	<i>Latin Name</i>	<i>Certain</i>	<i>Probable</i>	<i>Possible</i>
Sapphire, Star	Asteria, India	Yes		
Sapphire, yellow	Crateris		Yes	
St. Stephen's stone	Leucopetalos			Yes
Sard	Murrha	In part		
Sard	Sarda	In part		
Sard	Sauritis			Yes
Sardonyx	Murrha	In part		
Sardonyx	Sardonychus	Yes		
Satinspar	Ceraunia			Yes
Selenite	Lapis specularis	Yes		
Selenite	Catopyrites			Yes
Selenite	Selenitis		Yes	
Serpentine	Ophites	Yes		
Shark's teeth, fossil	Glossopetra	Yes		
Shell fossil	Encardia or Car- discae			Yes
Shell fossil, cast of	Bucardia		Yes	
Shell fossil, cast of	Enorchis	Yes		
Shell ornament	Cochlides	Yes		
Smithsonite	Smaragdus, Attican		Yes	
Smoky quartz	Capnias	Yes		
Smoky quartz	Mormorion or Pramnion	Yes		
Spinel	Carbunculus	In part		
Spinel	Carbunculus, amethyst-colored		Yes	
Steatite	Lapis Siphnos	Yes		
Steatite	Steatitis		Yes	
Talc	Argyrodamus			Yes
Teeth, fossil	Nympharena	Yes		
Topaz	Lyncurium		Yes	
Topaz	Chrysolithos	Yes		
Topaz, inferior	Leucochrysos	Yes		
Topaz, colorless	Pangonius			Yes
Touchstone	Lydian Stone or Coticula	Yes		
Tourmaline	Lyncurium		Yes	
Tourmaline, red	Lychnis		Yes	
Tufa, gray	Veientana		Yes	
Turquoise, green	Smaragdus, Her- mionian or Persian			Yes
Turquoise	Smaragdus, Median			Yes
Turquoise, green	Tanos		Yes	
Turquoise, green	Callaina	Yes		
Turquoise	Augites			Yes
Turquoise, blue	Callais	Yes		
Turquoise matrix	Callainae		Yes	
Verd antique	Ophites	Yes		
Zircon	Lyncurium			Yes
Zircon	Crateris			In part

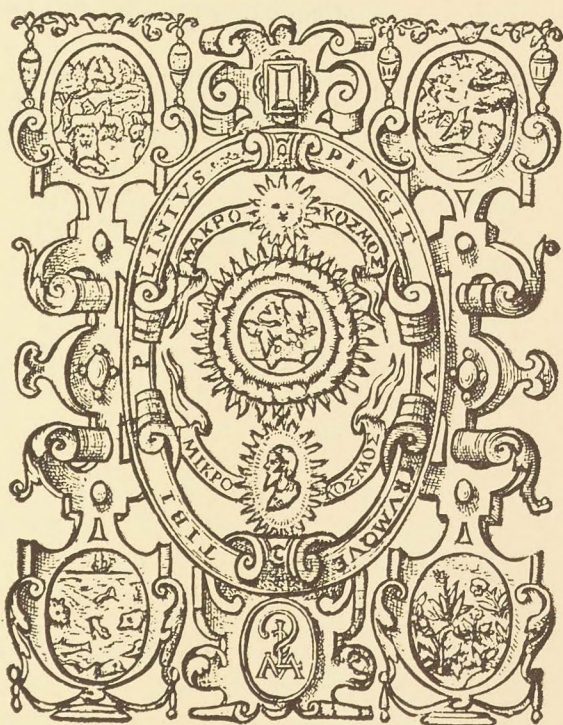
THE HISTORIE OF THE WORLD

Commonly called,

THE NATVRALL HISTORIE OF
C. PLINIVS SECVNDVS.

*Translated into English by PHILEMON HOLLAND
Doct̃or in Physicke.*

The first Tome.



LONDON,
Printed by Adam Jssip.

1601.

A ROMAN BOOK ON PRECIOUS STONES



Frontispiece is a reproduction of the title page of the Adam Islip
1601 edition of

THE HISTORIE OF THE WORLD
in the

WM. ANDREWS CLARK MEMORIAL LIBRARY
University of California at Los Angeles



Foreword

IN the following section of this book, printed on India paper to set it apart from the first and third sections, is a modernized English version of the 37th Book of *The Natural Historie of the World* by C. Plinius Secundus.

Adapted from the English translation by Philomen Holland, printed in 1601, the author — without changing the context of the translation—has attempted in his presentation to reword certain phrases and sentences for greater clarity and for the easier understanding of 20th century readers.

All foreign mineralogical names have been italicized, as have titles of books and manuscripts. Marginal notes show modern English names of gemstones. Periods following the modern name indicate the author's positive identification; a question mark signifies the identification as probable; whereas two question marks denote a possibility that the stone is the one named in the margin.

Superior figures within the text refer to the author's notes in the third section of *A Roman Book on Precious Stones*. There, more lengthy descriptions, and authority for statements made in this section, are given. These explanations are presented under chapter numbers corresponding to those in the Pliny translation.

Since it has been the unhappy task of the editor of this book to complete such work after the death of the author, it is her hope that the very small part she has played in preparing the book for publication may be worthy, in a very small measure at least, of the great ability of the author and the tremendous amount of time, effort, and research he gave to preparing the book.

It is her wish that this work, dear to the heart of the

author, will bring to its readers a greater understanding and appreciation of these beauties of Nature which were formed before Time was, and will live to bring pleasure and happiness until Time is no more.

— KAY SWINDLER, *Editor*

May 15, 1950



Contents

THE 37TH BOOK OF PLINY THE ELDER

<i>The First Use of Jewelry</i>	115
<i>The Ring of Polycrates</i>	115
<i>Achates of Pyrrhus</i>	116
<i>Famous Gem Engravers</i>	118
<i>The First Roman to Make a Collection of Engraved Gems</i>	119
<i>The Precious Stones Shown at the Triumph of Pompey</i>	120
<i>The Introduction of Murrhine Cups at Rome: Overindulgence in Same</i>	122
<i>The Properties of Murrha</i>	123
<i>The Nature and Occurrence of Crystallus</i>	124
<i>High Cost of Cups of Crystallus: Its Medicinal Virtues</i>	126
<i>Succinum: Inaccurate Statements Regarding It</i>	127
<i>The Various Kinds of Amber: Its Medicinal Properties</i>	133
<i>Lyncurium: Its Supposed Medicinal Virtues</i>	136
<i>The Noble Gems</i>	137
<i>Adamas: Its Species</i>	137
<i>Smaragdus</i>	142
<i>Varieties of the Smaragdus</i>	141
<i>Flaws of the Smaragdus</i>	142
<i>Tanos and Chalcosmaragdus</i>	145
<i>Beryllus: Its Varieties and Imperfections</i>	145
<i>Opalus and Its Subspecies</i>	147
<i>Flaws of Opalus</i>	148
<i>Sardonychus: Its Subspecies: Its Flaws</i>	149
<i>Onychus: Its Varieties</i>	151
<i>Carbunculus: Its Subspecies</i>	152
<i>Flaws of Carbunculus: The Methods of Testing It</i>	154
<i>Anthracitis; Sandastros</i>	155
<i>Lychnis</i>	156
<i>Carchedonia</i>	157
<i>Sarda: Its Varieties</i>	157

CONTENTS

<i>Topazos: Its Varieties</i>	158
<i>Callaina</i>	159
<i>Prasius: Chrysoprasius</i>	160
<i>Nilion; Molochitis</i>	161
<i>Jaspis: Its Many Varieties: Its Imperfections</i>	162
<i>Cyanos</i>	163
<i>Sapphiros; Amethystos: Its Varieties</i>	164
<i>Hyacinthos; Chrysolithos: Its Varieties</i>	166
<i>Chryselectrum</i>	167
<i>Leucochrysos; Melichrysos: Xuthon</i>	168
<i>Paederos and Related Stones</i>	168
<i>Asteria</i>	169
<i>Astrion; Astroites; Astrobolos</i>	170
<i>Ceraunia: Its Varieties; Iris: Iritis</i>	171
<i>Leros</i>	172
<i>Stones Alphabetically Arranged Achates, Etc.</i>	172
<i>Balanites, Etc.</i>	176
<i>Cadmitis, Etc.</i>	177
<i>Daphnias, Etc.; Encardia, Etc.</i>	179
<i>Galaxias, Etc.</i>	181
<i>Heliotropium, Etc.</i>	182
<i>Idaei-Dactyli, Etc.</i>	183
<i>Lepidotis, Etc.</i>	184
<i>Memnonia, Etc.</i>	185
<i>Nasamonitis, Etc.; Orca, Etc.</i>	186
<i>Panchrus, Etc.</i>	187
<i>Solis Gemma, Etc.</i>	188
<i>Trichrus, Etc.</i>	189
<i>Veneris Crines, Etc.; Zanthene, Etc.</i>	190
<i>Precious Stones Which Take Their Names from</i>	
<i>Parts of the Human Body</i>	190
<i>Precious Stones Named from Animals</i>	191
<i>Precious Stones Named from Objects</i>	191
<i>Newly Discovered Stones: Counterfeit and</i>	
<i>Artificial Stones</i>	193
<i>Forms of Cut Stones</i>	194
<i>How to Test Precious Stones</i>	195
<i>Comparative Advantages of Different Countries</i>	196
APPENDIX BOOK XXXVI	
<i>Gagates</i>	198
<i>Obsidianus</i>	199

Chapter I

THE FIRST USE OF JEWELRY

O that my history of nature may be complete, I now describe the precious stones¹ in which, in small compass, nature's majesty is demonstrated; in no other subdivision is she more admirably displayed, whether you take into account the varieties, the colors, the composition, or the beauty of precious stones. Certain gems² are so rare and precious that many men think it a sacrilege to engrave them as seals, lest their beauty and rank be thereby demeaned. Some precious stones are valued beyond all price, or at least at a higher price than any other of the world's goods; for each of us thinks some one gem is the epitome of nature's perfection and her supreme work. As to the earliest use of precious stones, from its inception to its growth to a height that astounds the world, I have in part treated in my description of Gold and Rings.* And yet I will not refrain from telling you that, according to the fables of the poets, the use of precious stones began on the rocks of the Caucasus where Prometheus was bound.³ He was the first man to put a small piece of the rock to which he was chained in a piece of iron and, placing it on his finger, had not only a ring, but also a gem-set ring, and on this the poets foolishly moralize.

* Book XXXIII



Chapter II

THE RING OF POLYCRATES

Due to the precedent of Prometheus, other stones became of great price and esteem and, hence, men greatly prized them. Polycrates of Samos¹, the powerful prince and mighty monarch of all the neighboring

islands and coasts, at the apogee of his career and happiness, which even he admitted was too great, was troubled that he had never suffered misfortunes. He believed he might appease and satisfy the goddess of luck if, of his own free will, he sacrificed a gem in his possession which he valued above all other things, thinking that his grief at the loss of such a precious stone would be sufficient to offset the spiteful envy of the changeable goddess. Indeed good fortune had pursued him and as no great sorrow had offset his happiness, he tired of his continued blessings. He, therefore, embarked on his royal barge and sailed it into deep water. There he took his ring, set with its precious stones, and intentionally threw it into the sea. And then what happened? A large fish, fit for a king, chanced to swallow the ring; as if it were bait. Later a fisherman caught the fish and because of its great size presented it to the king, who sent it to the royal kitchen. There the cook found in the belly of the fish the ring of his lord and master.² All this time sly fortune was cunningly twisting the rope by which Polycrates later was to be hanged! As is well known, this stone³ was a *sardonychus*,* and if we can believe tradition, the very same⁴ which is shown today in the temple of Concord at Rome, to which shrine Augusta, the Empress, gave it as an offering, enclosed in a golden horn. Even if indeed it be Polycrates' gem, nevertheless many other *sardonychi* in the collection of the temple are finer than it.

* Sardonyx.



Chapter III

ACHATES OF PYRRHUS

** Agate.

Next we should mention the stone which Pyrrhus, King of Epirus, owned, he who warred against Rome. He is reported to have owned an *achates** in which

could be seen the Nine Muses and Apollo with his lyre¹ truly pictured, not by art nor man's hands but drawn by nature; for the lines and streaks of the stone were so placed that one could see each of the muses, and each with her appropriate symbol.

With the exception of these two precious stones, writers do not mention other famous stones, unless we tell you of the gem of Ismenias, the minstrel. He is reported to have always worn many jewels, which were gay and gaudy. His vanity and his weakness for gems was such that a good tale goes the rounds about him; for he learned that a merchant in the island of Cyprus had a *smaragdus** engraved with a portrait of the maiden Amydone.² The price was six gold *denarii* and Ismenias gladly ordered the money to be paid instantly, but strangely enough the merchant was conscientious and, thinking his price too high, returned two of the *denarii* to Ismenias. The latter was enraged, crying that the return of the money had much impaired the merit of the stone. This Ismenias, it is believed, was the first to propose that all musicians and minstrels, including himself, should be known by their gems and should be professionally ranked by the number of gems which they wore. And in fact Dionysodorus, a great minstrel and the contemporary of Ismenias, had many ensembles of precious stones so that in no way would he be inferior to Ismenias. In those days there was a third musician, a buffoon as vain as the others, named Nicomachus, who loved to wear gems but he had not the taste to select them artistically. These examples, which fortunately serve as a fitting prelude to this book, may act to deflate the plumes of those who prize too highly the vain ostentatious show of precious stones, provided that these vulgar ones may be made to realize that their pride therein smells merely of the odor of some mediocre flute player.³

* Emerald, in part.



Chapter IV

FAMOUS GEM ENGRAVERS

* Emerald.

But to return to the gem of Polycrates, today it is to be seen in the temple of Concord, in perfect condition. Not only in the time of Ismenias, but for many years thereafter, it was customary to cut and engrave precious stones, even *smaragdi*.^{*} This is confirmed¹ by the act and edict of Alexander the Great which expressly forbade all others to engrave his image in precious stones except Pyrgoteles,² who was doubtless the leading gem engraver of his time. Later, Apollonides³ and Cronius⁴ were famed gem engravers, but especially Dioscurides,⁵ who reproduced in stone so faithfully the expressive face of Augustus Caesar. This intaglio served the Emperor and his successors as a signet and a seal. Sulla, the dictator, always used a seal portraying King Jugurtha, tied and bound as the latter was brought to him. We read in the *Chronicles* also that a certain Spaniard of Intercatia, whose father Scipio A. Emilianus had slain in single combat, always used thereafter a signet that portrayed the fight, and in consequence Stilo Praeconinus naively asked what this Spaniard would have done had his father killed Scipio. Augustus, the late Emperor of sacred memory, at first used a seal with an image of the sphinx upon it. Indeed, he had found in his mother's jewel case two identical seals, indistinguishable from one another, and one of these Augustus was accustomed to carry, no matter where he went. In his absence from Rome (during the civil wars which he waged against M. Antonius) his friends who managed his affairs, as the daily events required, signed with the other seal all letters and edicts which were executed in Augustus' name. Hence it resulted that those who received any such letters or edicts, regarding the controversial matters of the moment, were wont to lightly say that the said sphinx always came with a difficult riddle which could not be solved. Moreover, the frog which Maecenas⁶ used as a signet always terrified those who

received any papers sealed with it; for they knew that upon its receipt they would have to pay duties or taxes levied against them. But later Augustus Caesar,⁷ because of the prejudice that arose against his sphinx, gave it up as a seal and used thereafter the image of Alexander the Great.



Chapter V

THE FIRST ROMAN TO MAKE A COLLECTION
OF ENGRAVED GEMS

As to cabinets or cases of rings and other jewelry called by the Greek name of *dactyliotheca*,¹ the first Roman, so far as I know, who owned one was Scaurus,² whose mother was the wife of the dictator, Sulla. For a time no other gem collection existed in Rome. Later Pompey the Great³ captured the jewel caskets of King Mithridates and these and many other rich offerings he dedicated to the Capitol.⁴ According to the works of M. Varro and other reliable authorities of the time, his were much finer than the donations of Scaurus. In imitation of Pompey's gifts, Caesar, the dictator,⁵ consecrated in the temple of Venus Genetrix six caskets of rings and jewels and Marcellus,⁶ Octavia's son, dedicated one to the Palatine temple of Apollo. In conclusion, it should be emphasized that the victory which Pompey gained over King Mithridates made men's mouths water for pearls and precious stones: in the same manner as the conquests won by L. Scipio and C. Manilius engendered the love of silverplate, cleverly enchased and embossed; of rich hangings of cloth of gold, and of gold and silver threaded tissue, together with beds and tables of brass; and as bronze statues, vessels of Corinthian bronze and curious painted tables became the fashion as a result of the victories which L. Mummius gained over Achaëa:

Chapter VI

THE PRECIOUS STONES SHOWN AT
THE TRIUMPH OF POMPEY

That it may be more apparent how the triumphs of Pompey publicized gems, I will now put down word for word what I find recorded in the public registers regarding his triumphs. In the third triumph which was decreed him (his citation, for having freed the seas of pirates and privateers, for having brought Natolia and the kingdom of Pontus under the dominion of Rome, and for having defeated kings and nations), as is set forth in the seventh book of this history* he entered Rome the last day of September in the year when M. Piso and M. Messala were consuls. On that day there was carried before him a chessboard with men complete, this board being made of only two precious stones and yet it was one foot wide and four feet long,¹ and I emphasize these dimensions lest anyone should doubt and not believe them, since no precious stones of such extraordinary size are known today. I add that in this triumph he also showed a golden moon weighing thirty pounds, three banquet couches also of gold, other vessels of solid gold, and enough precious stones to fill nine gem cabinets; three images of beaten gold representing respectively Minerva, Mars, and Apollo; thirty-three gem-encrusted coronets; a square mountain made of gold, where one could see red deer, lions, and fruit trees of all sorts, the whole surrounded by a vine of gold; further, an oratory or altar enriched with pearls, on the top of which was a sundial. He also had borne before him, as a pompous show, his own image made of pearls; his portraiture, of which his regal majesty and its attributes unadorned would have been more worthy, and yet that fine face and venerable profile so highly honored among all nations was now all of pearls, as if that manly countenance and the severity of his visage had been vanquished and as if riotous excesses and frivolities had triumphed over him rather than he over them. O, Pompey, your title of

* Ch. VII.

Great would not have continued among your contemporaries, if in your first victory you had conducted yourself in this manner. What! Pompey, was there nothing else to do but gather pearls (things unnecessary,² superfluous and produced for women only, and which you once scorned to wear) and with them to portray and counterfeit your manly visage? And was this the way to ennoble yourself? Does not that memorial more nearly honor you and much nearer resemble you, that one which you caused to be erected on the top of the Piraenean hills? Your portrait, thus shown, was certainly a foul shame and an ignominious reproach to you. On the other hand, it was a wonderful omen foretelling the wrath of the gods, for so men were to believe, and evidently to infer from it, that the head³ of Pompey, then made of oriental pearls (and these the best of the East), would later be severed from his body. But with this one exception, how manly was all the rest of his triumph, and how worthy of him! For, first and foremost, he gave to the city hall 1000 *talents*; secondly, to each of his lieutenants and aides-de-camp who had performed such services in defending the sea coast, 2000 *sestertii*; thirdly, to every soldier who accompanied him on any one of his voyages he gave 50 *sestertii*. The magnificence of Pompey's triumph, however, served in part to excuse Caius Caligula, the Emperor, and to make his sensuality and his weak excesses more bearable; who, in addition to other effeminate tricks and womanly traits to which he was an addict, used to wear small buskins or half boots beset with pearls. Pompey's precedent, I repeat, to some degree justified Nero, the Emperor, who ornamented with fine large pearls the scepters and maces, the visors, and also the masks used by actors upon the stage; further, even the very couches which were sent along with him when he traveled.

So now, in consequence of this portrait, we seem to have lost the vantage and right which we once had to find fault with drinking cups set with precious stones,⁴ and, indeed, many other household appliances and furniture similarly ornamented. Fashion has gone to such

excesses that wherever we go, from one end of the house to the other, we seem to pass through rings or at least jewels fit to beautify our fingers only, but is there any other excess which seems less tolerable and less offensive than that of Pompey?



Chapter VII

THE INTRODUCTION OF MURRHINE CUPS AT ROME: OVERINDULGENCE IN SAME

* Murrha: agate and other species of cryptocrystalline quartz and fluorapar.

But to return to Pompey's triumph, this victory of his introduced to Rome the first *murrhine** cups¹ and vessels, and Pompey on that day was the first to donate to the temple of Jupiter Capitolinus six such cups. From that time onward men began to desire them,² in cupboards, in sideboards, and even in kitchens as vessels with which to serve meat. Since then, this excess has so overstepped all bounds that one large *murrhine* cup has been sold for 80,000 *sestertii* (say \$3174.). It was, however, both a beautiful and a large one and would easily contain three *sextarii* of wine (about one half gallon). Not so many years ago a nobleman, who had been a Roman Consul, used to drink out of a *murrhine* cup and once, in pledging the health of a lady whom he fancied, he bit out a piece from that part of the brim which her sweet lips had touched. Strangely enough this blemish increased the value of the cup and made it salable at a higher price; indeed, today, no other *murrhine* cup is more valuable than this one. But, as to other excesses of this Consul and how accustomed he was to extravagances of this kind can be gauged by the multitude of *murrhine* cups found in his cabinet upon his death.³ These the Emperor Nero took by force from his children. There were so many of them that, being placed on exhibition, there were enough to fill a private theatre which, for that

particular purpose, Nero had erected in a garden beyond the Tiber. This theatre Nero loved to have full of people to see plays he presented, dedicated to his wife, the Empress Poppaea, each time one of her children was born. There Nero, with other musicians, sang upon the stage before the plays began. I myself saw him there show the numerous fragments of a broken *murrhine* cup which he had carefully collected; this, I infer, in order to display a sight at which the world would lament and cry out against hateful Fortune, no less than as if these fragments had been the bones and relics of Alexander the Great or his corpse laid reverently in the sepulchre; and thereat Nero was not a little pleased. Titus Petronius, late consul of Rome,⁴ when at death's door, asked to see a fine broad-mouthed *murrhine* cup for which he had paid 300,000 *sestertii* (say \$12,000). He then broke it into a thousand fragments in hatred of and fear that Nero, the emperor, might seize it after his death and use it on his own table. But Nero himself, as became an emperor, exceeded all others in such excesses, for he bought one drinking cup for 1,000,000 *sestertii* (say \$39,675), a fact worthy of note that an emperor, father and patron of his country, should drink from a cup of so excessively high a price.

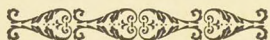


Chapter VIII

THE PROPERTIES OF MURRHA

But before we continue, it should be stated that these *murrhine* cups¹ come from the Levant; for they come from many Oriental places which otherwise are obscure, particularly from the kingdom of Parthia. The finest, however, come from Carmania. The stone of which these vessels are made is believed to be generated from a certain moisture thickened and baked, as

it were, within the ground by the earth's natural heat. This stone does not occur larger than suffices to make small bases of pillars or countingboards, and only rarely is it thick enough to cut into such drinking cups as I have described. These stones are, in a way, resplendent, but their brightness is not piercing and, to speak accurately, it may be called rather a smooth gloss or luster than a radiant and transparent clearness. But their variety of colors causes them to be so highly esteemed; for in these stones one can see certain veins or spots which, as the cup is turned, assume different colors, inclining partly to purple and partly to white. Later we will note they are of a third color, intermediate between the last two and resembling a flame of fire. As one holds them, their colors change, for their purple seems to incline toward white and their milky whiteness, in turn, toward purple. Some prefer those *murrhine* stones which seem to present, so to speak, a reflection of different colors meeting together at their edges and extremities, such as we see in rainbows. Others are delighted with certain tallowlike spots occurring in them. Those *murrhine* cups, however, are not highly valued which are pale or transparent in any part, for such characteristics are considered great faults and blemishes. Similarly, if there be seen in the *murrha* any spots like particles of grains of salt, or further, if it contains anything resembling warts, although not prominent but rather inconspicuous, as they frequently are in our bodies; finally *murrha* is also valued in part for the odor that exudes from it.



Chapter IX

THE NATURE AND OCCURRENCE OF CRYSTALLUS

* Rock crystal.

Crystallus,* however, is formed in the opposite way, namely from cold¹; for from a liquid it is congealed by extreme cold in the same way as is ice. This is proved by the fact that *crystallus* is only found where

the snow of winter is frozen hard; so that we can confidently say that it is really ice and nothing else. For this reason the Greeks have given it their name for ice, that is *crystallos*.^{2 3}

We obtain *crystallus* also from the East for there is none better than that which India sends us. It is also found in Asia, particularly about Alabanda, Ortosia, and in the mountains near these towns, but this *crystallus* is no better than that which is found in Cyprus. Further, Europe produces excellent *crystallus*, to be specific as to the locality, on the crests of the Alps. King Juba writes that in a certain island in the Red Sea, off the coast of Arabia, named Neron, near that island which supplies us with *topazos*,* *crystallus* occurs. Here Pythagoras, a governor under King Ptolemy, dug out a crystal one cubit in length (say 20 inches.) Cornelius Bocchus states that on certain exceedingly high mountains in Portugal, they sink pits to water level and there find large masses of *crystallus* of extraordinarily great weight. What Xenocrates, the Ephesian, reports is marvelous; namely that in Asia and Cyprus large pieces of *crystallus* are turned up in ploughing so close does it occur to the surface: an incredible thing as before no one believed it could ever be found in loose soil but only among cliffs and crags.⁴ Xenocrates' other statement is more credible, namely that *crystallus* is often carried down from the mountains by streams. Sudines is certain that *crystallus* forms only on places facing the south⁵; and this seems true for you never find it in moist countries facing the north, be the climate ever so cold, and even if the rivers are frozen solid to their beds. It is, therefore, necessary to conclude that certain waters, falling from the heavens, including rain and snow, are necessary to the formation of *crystallus*. As a result, its origin is not connected with heat; hence goblets of it are used only to drink water or other liquids which are cold; it is not suited for hot drinks. Strange as it seems, *crystallus* grows in six-angled forms: nor can a sound reason be given for this, particularly as the faces are not exactly of the same shape; but the sides between each edge are

* Peridot.

so absolutely smooth and even that no lapidary in the world could make the faces as flat and polished.⁶



Chapter X

HIGH COST OF CUPS OF CRYSTALLUS:
ITS MEDICINAL VIRTUES

The largest and heaviest piece of *crystallus* that I ever saw is that which Livia Augusta, the empress, dedicated in the capitol. It weighed fifty pounds (note Bohn has 150 pounds).¹ Xenocrates, the author quoted above, says one *crystallus* vessel existed that would hold an *amphora* (almost 24 quarts): and others say that *crystallus* goblets containing four *sextarii* (two and two-thirds quarts) have been imported from India. For the following I can myself vouch, that *crystallus* occurs in certain rocks in the Alps, so steep and inaccessible that those who collect it must do so by hanging from ropes.² These men, skilled and experienced in the trade, are directed by different indication and signs to where *crystallus* occurs and by these indications they can distinguish between good and bad *crystallus*; for it has many imperfections and flaws. In the rough it contains iron rust spots or clouds, or is full of specks: in other instances there is within it, so to speak, a hidden diseased ulcer; or there may be in it a hard knot which is brittle and apt to break into small fragments. Again it may contain grains like salt.³ Some pieces of *crystallus* contain red rust; others are full of hairlike fibres looking like so many flaws: but skilled artisans can hide this last imperfection when they cut and engrave the piece:⁴ for in truth if the *crystallus* be pure and water-clear, it is much more beautiful cut plain than if engraved. The Greeks call such crystals *aconteta**.⁵ in short, those are best which do not look like foamy but like limpid water; and the

*Pure well crystallized rock crystal.

heavier the crystal is the better it is considered. Certain physicians believe that there is not a better and a more healthful means of cautery for any part of the body which needs cauterization than a ball or globe of *crystallus*⁶ held between the part and the sun's rays.

Do you wish to hear of another notorious example of extravagant folly and madness respecting *crystallus* and *murrhine* vessels? Within the relatively recent past a woman of position in Rome, but one not excessively rich, bought a bowl or drinking cup of *crystallus* for 150,000 *sestertii* (some \$5,913). As for Nero,⁷ the emperor whom we have already mentioned, when disturbing news came of a great revolt and a battle lost, endangering his own position and that of the commonwealth itself, in the height of his rage and anger he grabbed two crystal drinking cups and bashed them into fragments. His hate was against all his contemporaries, consequently he felt that in no way could he enrage and punish them more than to render it impossible for any man to thereafter drink from these cups:⁸ for in truth, a crystal cup once broken cannot, by any known means, be reunited and made whole again.⁹ Today we have cups and vessels of glass that rival those of crystal: but it is extraordinary that, notwithstanding the resemblance, glass cups have not lowered the price of crystal¹⁰ cups but have rather caused them to increase in price.



Chapter XI

SUCCINUM: INACCURATE STATEMENTS REGARDING IT

Next in rank after *crystallus* we place *succinum*,^{*2} a substance which up to now I understand women,² and women only, have appreciated and have used to adorn themselves. It is strange that *succinum*, *murrha*, and *crystallus* are thus ranked alike among precious stones

* Amber.

although *murrha* and *crystallus* in some ways deserve a higher rating for they are so suited to making cups from which hot or cold drinks can be drunk; but as to *succinum*, our fops and dandies have as yet found no reason why such store should be set by it. It is surely the folly and deep-seated vanity of the Greeks that has established its reputation and given *succinum* such a high position. And here I must ask the reader to bear with me in a discourse on the early history of *succinum*: for I feel that it is worth while to set forth the marvels and wonders which the Greeks have ascribed to it, so that my contemporaries and the generations to come may know these frailties of the Greeks. In the first place many of their poets and, as I believe, the principal and better ones of them, namely: Aeschylus, Philoxenus, Nicander, Euripides, and Satyrus, tell us a story that the sisters of the young prince Phaethon,³ weeping piteously⁴ at the miserable death of their brother struck by lightning, were turned into poplar trees, which instead of tears each year yielded a certain liquid called *electrum** which issued from them. These trees grew along the Eridanus River which we call Padus, or in other words the Po; and it was called *electrum* because the sun was called by the ancient Greeks *elector*.⁵ But that this is a mere lie, all Italy will testify. On the other hand, some Greek writers, the more studious and those better versed in natural history, have told us of certain coastal islands in the Gulf of Venice called Electrides⁶ since amber is gathered there. They are supposed to be situated east of where the Po River, just mentioned, enters the sea. Notwithstanding this statement, it is known that no such islands exist in that part of the world and certainly there are no islands near that place to which the Po could carry anything. As for Aeschylus, the poet mentioned above, who said the Eridanus River is in Iberia, that is to say Spain, and that it is in addition called Phodanus; further as to Euripides and Apollonius who said that the Rhodanus and Po join and discharge through one common mouth into the said Gulf of Venice, these poets by such statements show their gross ignorance even of geography.

* Amber.

Consequently, they should be pardoned if they do not know what amber is. Those who write in a more restrained manner and yet who lie as well as the best, inform us that upon the inaccessible rocks of the coast of the above-mentioned Gulf of Venice or the Adriatic Sea, trees grow which annually, when the Dogstar rises, exude a gum which is amber. Theophrastus, on the other hand, states that amber is dug from the ground in Liguria.⁷ Chares, on his part, says that Phaethon died in Aethiopia⁸ near the temple of Jupiter Ammon, and in consequence, not only is there a shrine dedicated to him there but also a well-known oracle. In the vicinity, he states, amber is formed. Philemon would have us believe that amber is a mineral and that in two localities in Scythia⁹ it is dug from the earth: in one locality it is white and the color of wax and this they call *electrum*: in the other it is of a reddish or tawny color, and that is named *sualiternicum*. Demonstratus calls amber *lyncurion* as it forms from the urine of the wild beast¹⁰ called the lynx. There are two colors, that from the male is reddish and of a fiery color; that passed by the female is lighter in color, approaching white. Some call it *langurium* and state it comes from certain wild animals in Italy, called *languriae*. Zenothemus calls the animals *langae* and states that they live near the Po. Sudines states that a tree in Liguria produces amber: Metrodorus reports the same. Sotacus was certain that it trickled from certain trees in Britain¹¹ which he called *electrides*. Pytheas states that in Germany there is an arm of the ocean called Mentonomon which is inhabited for some 6,000 *stadia* by a tribe named *Gutti*.¹² Within a day's sail of this bay, there is an island called Abalus, where at every spring tide the sea waves, at high water, cast up great quantities of amber; and that it is believed to be merely an excretion cooled and hardened which is at that time purged and thrown out by the sea. He adds that the natives are accustomed to burn it as a fuel and to sell it to the Saxons and other Germans, their neighbors. Timaeus agrees except that he calls the island Baltia. Philemon believed that amber forms no flame when

burned. Nicias would have us believe that amber is a juice or liquid proceeding, in some way, I know not how, from the sun's rays. To his way of thinking the said rays are very hot as the sun sets, and these, rebounding from the earth, leave behind a certain fatty sweat¹³ in that part of the ocean: and that this is afterwards cast up by the tides along the German seashore. He adds that in Egypt where it is called *sacal* it is formed in a similar way: also in like manner in the land of the Indians¹⁴ who value it more than frankincense. He adds that in Syria the women make whorls of it for their spindles: and that there it is called *harpax*,¹⁵ because it will pick up leaves, straws, and fringes hanging from robes. Theochrestos reports that the ocean at tide time casts up amber along the capes of the Phrenaeon mountains.¹⁶ This was also believed by Xenocrates who is the latest writer on amber and related substances. There is living today Asarubas, who states that near the Atlantic Ocean there is a Lake Cephisis, which the Moors call Electris and that this lake, after being thoroughly heated by the sun, spews up from its mud, amber which then floats on the surface. Mnaseas describes a place in Africa called Siccyone and also the nearby river Crathis, which flows out of a slough and enters the sea. There live in this lake or slough certain kinds of birds called *meleagrides* and *penelopes*. He states that amber is here formed in the same manner as in Lake Electris. Theomenes says that near the great Syrtis, where the garden of Hesperides is, amber is believed to fall out of the garden into a lake where the virgins, priestesses at the place, go to procure it. Ctesias affirms that in India there is a river called Hypobarus (i.e. bearing up all good vessels) rising in the north and emptying into the eastern ocean: nearby is an uncultivated mountain covered by trees that produce amber. He adds, moreover, that these trees are called *aphytacorae*, a term meaning "delectable sweetness." Mithridates writes that near the German coast there is an island named Osericta filled with cedar trees which yield amber;¹⁷ the latter drops from the trees onto the rocks. Xenoc-

crates believes that amber was called in Italy not only *succinum* but also *thieum*: whereas the Scythians name it *sacrium* (for amber also occurs in Scythia). He adds, some authorities say it also occurs in Numidia. But I am astonished that Sophocles, the tragic poet (a man who wrote poetry in so thoughtful and lofty a style, and lived such an honorable life: born in Athens, a descendant of nobles, prominent in state affairs, and commander of an army), should exceed all others in fabulous reports regarding amber: for he does not hesitate to say that in Further India, amber forms from the tears of the birds *meleagridae*,¹⁸ wailing and weeping over the death of Meleager. One marvels that he should believe this or that he should expect others to share his opinion. For is any child so simple and ignorant as to believe that birds should shed tears each year on a certain date and especially such large drops and in such quantity as to produce amber in abundance? Besides is it consistent that birds should go as far as the Indies and even beyond them to mourn and lament the death of Meleager who died in Greece? What is the answer? Are there not other tales equally fabulous which poets have broadcast to the world? Perhaps the fact that they are poets, feigning and devising fables, may in part excuse them. But that any man should seriously, and as if historically, invent such stuff regarding a commodity so well known and common, brought to the public's attention daily and in abundance by merchants, is alone enough to refute such insolent lies. It is, to the highest degree, a mockery of the world's intelligence: an insult to all men. It indicates not only a habit of lying but also a lack of fear of that vice, even when uncontrolled.

But let us leave the poets with their fables and speak factually and with knowledge of amber. It is known definitely to occur in certain islands of the Northern Ocean where the latter strikes the German coast: and the Germans call it *glessam*:¹⁹ and in consequence in that sea voyage which Germanicus Caesar made into those parts, our fellow citizens named an island *Glessaria*, as amber was found on it. This island, how-

ever, the barbarians called Austravia. Amber is formed in certain trees of the general family of pines²⁰ and it issues forth from their trunks like gum from cherry trees and resin from pines. In truth, these trees are so full of this liquor that they swell and yield abundantly. This liquor is afterward either congealed by the cold or coagulated by the autumn heat. Now if at any time the ocean has an unusually high tide which washes any of the sands from the islands, amber is then cast ashore on the German coasts; it is there rolled and, therefore, seems in very truth to hang upon and settle lightly on the sands where it is easily recovered. From the fact that our forebears long ago believed it to be the gum of a tree they called it in Latin, *succinum*. That amber is derived from some kind of a pine tree is shown by this fact, if one rubs it he produces the smell of pine wood: also that when it is burned, both the flame and the smoke resemble that of torch wood. The Germans have a great trade in it and bring it into Pannonia, and from thence to us, through our provinces of Istria and Venice, for from Pannonia, the Venetians first (who live on the frontier of that country and whom the Greeks call Heneti) received it as merchandise in the ports along the Adriatic. So by that means, they created a reputation and a demand for it: and this normal traffic may have occasioned the tale, already recounted of the Po and the poplars along it that weep amber. Even today, the country women of Lombardy and those along the Po wear necklaces and collars of amber beads, mainly to adorn themselves, but in part also for their own health; for they believe that it prevents the inflammation of the tonsils and other diseases of the throat and the pharynx: for the people of that region are subject to goitre, about the fleshy parts of the throat, caused by the local water which breeds the disease. The aforesaid coast of Germany is almost six hundred miles from Carnuntum in Pannonia and yet in recent years it has been visited by merchants from many quarters. A knight of Rome²¹ was the first who had been commissioned to go there by Julianus (who was in Nero's time in charge of the

tragedies and gladiatorial shows) with instructions to buy up amber in quantity. This knight surveyed in detail all those coasts, observed everything regarding the trade in that commodity, and brought back to Rome so much amber that the great nets (to protect the projecting and exposed stand within the amphitheater against the wild beasts which were there baited and forced to fight) were fastened and decorated with amber: also the armor, and indeed the biers and other properties of those gladiators who happened to be killed in the ring. In a word, all the appliances and fittings necessary for each separate day of such a fiesta or festival were largely of amber. The largest piece he brought back weighed thirteen pounds.²² It is further definitely known that amber is found among the Indians. Archelaus, who was once king of Cappadocia, wrote that from India amber is brought, rough and unfabricated, with pieces of bark adhering to it; and that the way to clean and polish it is to place it in the boiling grease of a sow that is suckling her young. That when amber drops from the tree it is a clear liquid is shown by the diverse things imbedded in it,²³ ants, gnats, and lizards which doubtless were entangled and then enclosed when it was green and fresh and were later entombed as it hardened.



Chapter XII

THE VARIOUS KINDS OF AMBER: ITS MEDICINAL PROPERTIES

There are many kinds of amber.¹ The white is most redolent and fragrant:² but neither that variety nor those colored like wax are expensive. The highly colored amber, namely that of a deep yellow color verging toward the red, is much more valued particularly if it is clear and transparent, provided, however,

that it does not glitter too much. That amber which is esteemed somewhat resembles fire, but it should not be too fiery. But the best amber is that called *falernian*, which is colored like a Falernian wine, this is clear and transparent and has a lively luster, pleasant to the eye. But others prefer amber of a light yellow, like boiled and clarified honey. It should, however, be known that amber can be given any color or tint desired. In this process, suet of small goats and the root of orchanet is normally used: and some amber has even been dyed purple.

As to the properties of amber; if it is rapidly rubbed and chafed between the fingers, the potential power that is in it is set to work and is put in operation. You will then note that it draws³ to itself chaff, straws, dry leaves, and even slivers of the linden tree in the same way that the loadstone attracts iron. Moreover, shavings scraped from amber and put into lamp oil will burn and maintain light longer and the light will be clearer than with wicks or woven fibres made of the very best flax. As to the esteem in which our fops and triflers hold it; some there are who gladly will give more for a statuette or image made of amber, be it ever so small, than for the healthy and strong body of a tall man and a valiant soldier.⁴ But what should be the fate of such people? They deserve to be well punished for their perverted judgment and a rebuke from a single author is not enough. I can better agree with those who take pleasure in other things, and in my opinion with more reason. To desire Corinth vessels is reasonable on account of the special temper of its brass due to its gold and silver content, to metal objects, engraved, enchased, and embossed, because of the skillful art and the clever design on such vessels. Such properties may well captivate the spirit of the buyer and lead him to offer a high price for it. As to *murrhine** and crystal cups, I have already described their gracefulness and told you why they may entrance a collector and cause him to bid high and offer much money for them. Fair pearls, especially large ones, are in demand by women for their ornamentation.

*Murrha: agate and other species of cryptocrystalline, quartz and fluorspar.

and to emphasize the beauty of their heads; gems and precious stones adorn and beautify our fingers. In resumé, there is no other extravagance which we have but that is grounded upon some picturesque use or else upon some ostentatious display which it may make. As for amber, I see nothing in the world to recommend it; only a fad enjoyed by people, they know not why, in conclusion a weak and wanton folly. And in truth, Nero Domitius among many other stupidities and exhibitions of vulgar ostentation by which he showed what a monster he really was, went so far as to compose a sonnet in praise of the hair of the Empress Poppea, his consort, which he compared to amber and, as I can remember in one stanza of his diaty, he called her hair *succina*, that is amber-colored. From that time to this our society leaders and fine ladies have had their minds on this color and have placed it as the third among the rich ranking colors: by which we can see that there is no futile or asinine thing in the world that has not the pretense and protection of some fine name. And yet I will not rant against amber too much. And why? Because it has its use in medicine.⁵ But I must add, feminine social leaders disregard this: its medicinal virtues certainly are not the reason for their love of amber. It is, however, true that a necklace of amber beads worn about the necks of little babies is a great protection against secret poisons and a countercharm against witchcraft and sorcery. Callistratus says that such necklaces are good for all ages, to preserve the wearer from fantastic illusions and fears that drive one out of his senses: further, amber, whether taken in drink or hung about one, cures strangury. This same Callistratus introduced a new name to distinguish yellow amber from other varieties calling it *chryselectrum*,* that is golden amber. And in reality this type of amber is of a fine and beautiful color in the morning. This variety alone has also the property of catching fire readily, for if near fire you will soon see it burn. He says of this yellow amber that if it be worn as a collar about the neck it cures fevers and heals diseases of the mouth, throat, and

* Yellow Amber.

jaws and, powdered and mixed with honey and oil of roses, it is an excellent remedy for diseases of the ears. Compounded with the best Attic honey, it is an excellent eye salve improving dim sight; and pulverized and taken alone as a medicament, or drunk in water with mastic it is an excellent remedy for all diseases of the stomach. Further, amber is especially adapted to imitate many precious stones and these imitations are notable for their transparency and clearness, but more particularly to imitate *amethystos*,* since as I have already related amber can be colored any tint desired.

* Amethyst.



Chapter XIII

LYNCURIUM: ITS SUPPOSED MEDICINAL VIRTUES

The ridiculous statements of some authors who have written of *lyncurium** leads me to mention it immediately after amber; for although it may not be *electrum* or amber as some hold, yet all insist on this, namely that it is a precious stone.¹ They further hold that it is the urine of an ounce and that this animal at once covers it over with the earth, out of spite toward man, that the latter can in no way benefit thereby. These authors, moreover, state that the ounce stone or *lyncurium* is the same color as that ardent amber which resembles fire, and that it is suitable for engraving seals: and according to them it not only attracts leaves and straws but also thin plates of brass and iron. In this both Diocles and Theophrastus agree. I believe all these statements are lies: nor do I believe that in our time any man has seen a precious stone of that name. As to what is written as to the medicinal virtues of *lyncurium*, I believe them to be fables. These include that if given in drink, it evacuates bladder stones: if drunk in wine it quickly cures jaundice or if even carried upon one it will do the trick. But enough of such fantastic dreams.

* Reddish yellow
topaz or
tourmaline?
Zircon?

Chapter XIV

THE NOBLE GEMS

It is now time to describe those precious stones of undoubted position. I begin with those which are admitted by everyone to be the most valuable and the highest as to price. In this discourse I will not follow this theme alone, but also (in order to further the knowledge of posterity in those things which benefit life) I mean first to have a fling at the magicians, to refute their detestable lies and unnatural vanities, for in no way have they so overstepped themselves, as in their accounts of gems and precious stones. These exceed the statements of doctors and even the limits of medicine, and as good and efficacious remedies they tell us a tale of the great medicinal virtues and values of precious stones; both incredible statements.



Chapter XV

ADAMAS: ITS SPECIES

Adamas^{*1} is the most valuable not only of precious stones² but of all things in this world: and for a long time *adamas* was known only to kings and princes, and even to few of them. It is the only gemstone that is found in metal mines. Very rarely, and then only as a miracle, is *adamas*³ found in gold veins although it would seem it should only grow in gold.⁴ Ancient writers believed that it only occurred in the mines of Aethiopia,⁵ and there only between the temple of Mercury and Meroe Island; adding that the best *adamas* that was ever found did not exceed in size a cucumber seed to which it is not unlike in color. But today we know of six kinds of *adamas*. The Indian does not occur in gold mines but with crystal and is somewhat

* Diamond with other colorless gems.

similarly formed: for the two are not different as to transparency and limpidity nor in the smooth sides and faces lying between the six angles. *Adamas* is pointed sharply at one end as is a top, or else two contrarily placed pointed parts as if the flat ends of two tops were set upon one another and joined:⁶ the largest are the size of a filbert nut.⁷ The *adamas* of Arabia* resembles⁸ that of India although it is smaller: they occur in nature in a similar way. As for their other characteristics they are of a paler and more yellow color, indicating from what country or locality they come. They occur only in gold mines, and only in the best of them. The way to test the *adamas* is upon an anvil:⁹ since strike even upon the point of the *adamas* with a hammer as hard as you can, it defies all blows and instead of the stone yielding, the hammer flies into pieces and even the anvil splits in half. The hardness of the *adamas* is thus wonderful and supernatural:¹⁰ its nature also conquers the fire's fury¹¹ nor can you, try as you may, make it hot. From its untamable nature the Greeks called it *adamas*. One kind the Greeks call *cenchros*,* since it is as big as a millet seed. A second kind they call the *macedonian*,* which is found in the gold mine near Philippi. This *adamas* for size is comparable to the cucumber seed. After these is the *cyprian*,* so called because it is found in the island of Cyprus. It verges on the color of bronze but in medicine, as I shall later demonstrate, it is most valuable. Next I must place the *adamas* called *siderites*,* which shines bright as steel, whence its name. As to weight it surpasses the others but differs greatly from them: for if struck by the hammer it breaks into pieces. Further, other *adamae* readily pierce it and bore a hole through it. The latter statement is also true of the Cyprian *adamas*:* in fact these last two are only called *adamas* by courtesy; since they are not true but bastard *adamas*. As to the attraction and repulsion between natural things which the Greeks call *sympathia* and *antipathia* (of which I have written much in all my books and with which I have attempted to acquaint my readers), in no other substance can these be better seen than in

* Diamond?

* Diamond?

* Rock crystal?

* Rock crystal.

* Magnetite.

* Rock crystal.

the *adamas*: for this invincible mineral (against which neither fire nor steel, the two most forceful and powerful creations of nature, have any control for it curbs and disregards both of them) is forced to bow to, and be conquered by, the blood of a goat,¹² the only thing capable of breaking it in pieces. However, care must be exercised that the *adamas* be steeped in the blood, fresh drawn from the beast before it is cold. Yet even when you have well steeped it, you must strike the *adamas* many blows with the hammer on the anvil: for even then, unless hammer and anvil are of excellent quality, they will be conquered and both will break. Personally, I would like to know who first soaked *adamas* in goat's blood, whose mind first thought of it, or rather more probably by what chance was it discovered and known? What suggestion led someone to perform such an unique and extraordinary experiment, especially with a goat, one of the filthiest animals in the whole world? Certainly I must ascribe this invention and all similar ones to the might and the benevolence of the divine powers. Nor should we argue and reason how and why nature does this or this: it is enough that she so willed it and would have it so. But to return to the *adamas*,⁵ if by this process the *adamas* is once broken, it separates and crumbles into small bits which the eye can scarcely see. These the lapidaries prize highly and seek after:¹³ they set them in handles of iron and with them cut with ease any substance, no matter how hard. Further, there is such natural enmity between *adamas* and the lodestone¹⁴ that if the former be placed near iron, it will not permit the latter to be drawn away by the lodestone, further if the lodestone has been placed so close to the iron as to have attached it, the *adamas*, if placed nearby, will cause the lodestone to loosen its hold and let go of the iron. *Adamas* has the property of offsetting the bad effects of poison: it drives away those hallucinations that cause people to go insane: it expels vain fears that trouble and possess the mind: hence some have called it *anachites*.¹⁵ Metrodorus of Scepsis states that the *adamas* is found in Germany on the island Baltia, where amber is formed.

but to my knowledge he is alone in this claim. He prefers this German *adamas* to that of Arabia, although as to this and other things, as all know, he is an accomplished liar.

After the precious *adamas* of India and Arabia, we in Rome next prefer the pearl, but concerning it, I have written enough in Book IX where I described the products of the sea.



Chapter XVI

SMARAGDUS

* Emerald and other green gems. Copper-stained quartz??

*Smaragdus**¹ for many reasons deserves the third place,² that is, the one after *adamas* and the pearl: for, of all colors, green is the most pleasing to the eye. We love to see green shrubs and the leaves of trees but such pleasure is not to be compared to that we derive from seeing a *smaragdus* for no other green is so pleasant. Further, there is no gem or precious stone that so satisfies the eye but never tires it. Indeed, if the sight has been wearied or dimmed by intensively looking on any other object,³ it is refreshed and restored by looking upon this stone, and lapidaries who cut and engrave fine stones know this well for they have no better method of resting their eyes than by looking at the *smaragdus*, its mild green comforting and removing their weariness and lassitude. Further, the longer and the further off one looks at *smaragdi*, the more beautiful and larger they seem to the eye, by reason of the fact that they cause the reverberations of the air about them to seem green, neither sunlight nor shade nor candlelight changes them nor causes them to lose luster. On the contrary, they continually send out their own rays a little at a time, so they reciprocally hold the visual beams of the eyes, and notwithstanding the depth and thickness which these gems have, they permit our

sight to gently pierce to the very bottom of the stone, a thing that is not usual in water. *Smaragdi* are frequently cut concave in order to gather, unite, and fortify the rays that serve our eyesight. Because of the many benefits that they vouchsafe our eyes, by general consent they are not cut into intaglios, and lapidaries are strictly forbidden to facet and engrave them. On the other hand, the *smaragdi* of Scythia* and Egypt* are so hard⁴ that they cannot be pierced or shaped by any tool. Moreover, when you encounter a table-cut *smaragdus*, hold the flat face against any object and it will reproduce to the eye that object as faithfully as a mirror or looking glass might. In truth, Nero, the emperor, was accustomed to see the gladiatorial shows in a fine *smaragdus*.⁵

* Green sapphire?

* Emerald.



Chapter XVII

VARIETIES OF THE SMARAGDUS

The first thing to note about the *smaragdus* is that there are twelve varieties of it.¹ The best and most esteemed of all these is that of Tartary, which is also called *scythian*,*² from the land of its origin, Scythia. None are of richer and deeper color or of fewer blemishes, and so far as *smaragdus* surpasses other precious stones, by the same margin the *scythian* surpasses other *smaragdi*. The Bactrian *smaragdus**—and it comes from an adjoining land—is next esteemed to the *scythian*. They are found in crevices and joints of rocks and are to be found, it is said, about dog days, when the northeast Etesian winds³ blow; for they then glitter and shine among the sands in which they lie, and hence they are seen. These are said to be far smaller than those of Scythia. In the third rank are the *smaragdi* of Egypt,* and⁴ they are found in certain craggy hills and cliffs about Coptos, a town in upper

* Green sapphire.

* Emerald?

* Emerald.

* Chrysocolla, in part
malachite?

Egypt. As for all other varieties, they are ordinarily found in copper mines. Of these, those of Cyprus* are⁵ considered the best of the remaining nine varieties, and yet their high position depends not from any clear or mild color which they have, their only recommendation being that they seem moistened with a certain oily luster and from whatever angle they are viewed, they resemble the water of the sea, for they are both transparent and lustrous, and in consequence they send out a color of their own and, further, because of their transparency, receive the penetrating beams of our eyes. It is reported that on the Island of Cyprus near the tomb of Hermias, a petty kind, (and here on the shore near the sea there were poles and racks covered with large fish ready to be salted) there was in ancient times a statue of a lion of marble. In its head were set two fine *smaragdi* as eyes, looking out to sea. They so glittered, piercing deeply into the water, that the tuna fish of the coast were frightened and fled from the nets and the other paraphernalia of the fishermen. For a time the fishermen were nonplussed but, finally realizing what had happened, they put other eyes into the lion, removing the *smaragdi*.



Chapter XVIII

FLAWS OF THE SMARAGDUS

I should now record the imperfections and flaws of the *smaragdus*, since a gem buyer can be easily deceived and bewildered in selecting them. First of all, *smaragdi* have blemishes¹ but like humans each has its own particular type of flaw, varying with the country from which it is derived, for those of Cyprus are not of an uniform green, but in a single stone, as it were, you will see different greens in different parts of the stone; nor do they ever have that rich green of a single

tint as in the Scythian *smaragdus*. Further, in some *smaragdi* you see clouds or shadows, which destroy the clear color of the stone. Nor is the *smaragdus* esteemed if it is overly bright. Because of these imperfections *smaragdi* are given different names and divided into different kinds: some are too dark and these are called blind; others are thick and without clearness or transparency; and still others are but little esteemed and are not regarded because they contain cloudlets, a defect different from the shadows already mentioned. This cloudlet is a white fault and in consequence the *smaragdus* is not evenly green throughout, for one sees in it a white speck either in the center of the gem or at its base. So much for its faults as to color. But within the *smaragdus* other faults are observed, either hairy streaks or hard specks like salt kernels or spots of lead. Next to the Cyprian *smaragdus* stands that of Aethiopia which our authority, King Juba, says are found in Aethiopia* three days journey from Coptos in Egypt. (Other texts give 25 days.) These are of a cheery and lively green but only rarely are they clear and of a pure and homogeneous color. With these Democritus placed the Hermionian and the Persian *smaragdi*.* The first seems to swell as if it were embossed and fatty withal: the Persian is not transparent and yet is of an agreeable and uniform green which is sufficiently pleasant to the eyesight although it does not pierce or enter it, and *smaragdi* of this kind resemble the glowing eyes of cats and panthers since they glitter and shine and yet they are not transparent. If exposed to the sun, these *smaragdi* lose their luster and become lifeless: but in the shade they shine brightly and cast their beautiful rays farther from themselves than any other variety. In general, however, they have this fault that they have the color either of gall or of the sky, further in the sun they glitter and shine but are still not green. Similar defects are particularly characteristic of the Attic *smaragdi**² found in the silver mines at a place called Thoricos: although these are not as greasy or oily looking as are the varieties just described. They always appear to better advantage at a distance

* Emerald.

* Green turquoise??

* Smithsonite?

than near at hand but they are subject to the lead fault, in other words in the sun's rays they have a leadlike hue. Further, they alone among the *smaragdi* have this peculiarity that some deteriorate with age inasmuch as they gradually lose their lively green and in addition in the sun they lose their luster. After the Attic *smaragdi*, those of Media* are considered the greenest and in instances they resemble the green *sapphiros*.* Their colors are wavy and the stones seem to have in their interior various shapes and figures, such as poppyheads, birds, wings, fins, locks of hair, etc.

Such *smaragdi* as are not naturally green may be improved and reach their full beauty by being washed in wine and oil. In a word, there are no larger *smaragdi* than those of Media. As for the Chalcedonian *smaragdi*,* I am not sure whether they now exist, since the copper mines no longer produce them, and yet at their best they were the smallest of all *smaragdi* and were sold at the lowest price. These *smaragdi* were brittle and fragile and their color was not settled but was uncertain and changeable, resembling for all the world the green feathers in a peacock's tail or the feathers of a pigeon's neck. As one held or turned them one way or another they shone in varying degrees: further, they were full of veins and scales. These *smaragdi* were subject to a special flaw which lapidaries call *sarcicon*, that is a certain resemblance to flesh, characteristic of some gems. They were found in a certain mountain near Chalcedon, which was therefore named Smaragdites. King Juba writes that the *smaragdus* called *cloras** was much used by the Arabians in buildings, since to adorn and embellish their houses they were accustomed to enclose and set it into the walls in the same manner as did the Egyptians the white marble called *alabastrites*.* He also reports that many other *smaragdi* occur nearby in Mount Taygetus in Laconia and these are called *laconic*, and they closely resemble those of Media. He says others occur in Sicily.

* Intergrown malachite and azurite? Turquois??
* Lapis Lazuli.

* Bornite?

* Green alabaster.

Alabaster.

Chapter XIX

TANOS AND CHALCOSMARAGDOS

To be considered one of the *smaragdi* is a gem exported from Persia called *tanos*.^{*} It is, however, of an unpleasant green and is full of flaws. Along these lines is the stone *chalcosmaragdus*,^{*} found in the island of Cyprus, which contains in it certain veins of copper that detract from its green color. Theophrastus states that he has read in the books and records of the Egyptians that a Babylonian king sent as a present to an Egyptian king a single *smaragdus*^{*1} four cubits long and three broad: also that in the temple of Jupiter in Egypt there is an obelisk made of four *smaragdi* and that this obelisk is forty cubits long and from two to four cubits wide. He further adds that while he was writing his book there was at Tyre in the temple of Hercules a pillar made of a single *smaragdus*, unless by chance it was of a bastard *smaragdus*,^{*} for such he says exists. In support of the latter statement, there was discovered in Cyprus a stone one half of which was ordinary *smaragdus*, the other *jaspis*^{*} as if the liquids had not fully transformed and converted the latter into *smaragdus*.² Apion the grammarian, surnamed Plistonices (i.e. Contentious), wrote not long ago and it can be found in one of his books, that there was still in the labyrinth of Egypt a giant image of the Egyptian god Serapis nine cubits high carved from a single *smaragdus*.

* Green turquoise?

* Malachite with sulphite stringers?

* Glass?

* Jasper and malachite intergrown?

* Jasper.



Chapter XX

BERYLLUS: ITS VARIETIES AND IMPERFECTIONS

Many believe that *berylli*^{*} are of the same nature as *smaragdi* or at least very similar to them.¹ Their native home is India² and they are rarely found elsewhere. Lapidaries skilled in their art know how to cut them

* Beryl, etc.

* Aquamarine.

* Golden beryl.

* Chrysoprase? In part
greenish beryl??

* Deep blue beryl.

* Sapphire.

* Pale blue beryl.

* Common beryl.

† Common beryl.

* Common beryl.

* Rock crystal.

with six angles and to polish the faces smooth. Otherwise their luster, which is rather weak, would indeed be dull and lifeless, if it were not enhanced and revived by reflection from those six angles, for even if they are finely polished in any other form, they have not the lively luster which the polished six faces give them. Of *berylli*, those are most esteemed which are of a sea green, * ⁴ the color of the sea when it is calm. Next in esteem are those called *chrysoberyli*.^{*} These are paler and their color tends toward that of gold. There is a third kind, somewhat similar but even paler (although some do not consider it a *beryllus*, but a distinct mineral species) and this is called *chrysoprasos*.^{*} In the fourth rank are placed those *berylli* called *hyacinthizotes*,^{*} as they somewhat resemble the *hyacinthos*.^{*} In the fifth place are those of the color of the sky hence called *aeroides*.^{*5} Following them are the Cerini *berylli*^{*} which resemble wax; then the *oleageni*,[†] that is those of the color of oil. And in the last place are the *crystalline*^{*} which are white and resemble *crystallus*^{*} All *berylli* have the following imperfections: white hairy streaks or lines and in addition other homely flaws: or if without these flaws they are apt to be pale and lifeless.

The Indians⁶ are particularly fond of long *berylli* and consider them the finest stones and gems in the world, and such stones they do not set in gold but prefer to wear them without it. In consequence, the Indians bore holes through them and then string them as chains or collars with elephant hairs, but when they find an absolutely perfect *beryllus*, such stones are not pierced but the Indian jewelers, tipping them with gold, insert in their ends knobs of gold, as bosses thus terminating and enclosing the two ends of the crystals. In fact the Indians love to cut their *berylli* in long columns or pillars like cylinders, rather than after the manner of other gems because their chief beauty and value lies in their length. Some authorities believe that the *beryllus* occurs in nature with smooth faces and six angles. Those *berylli* are regarded as the best which are pierced and have the white pith taken out. This process gives them

a better luster when mounted in gold; since by the reflection of the gold, the too great transparency of the gem is given more body and is somewhat improved. In addition to the faults already noted, *berylli* are also subject to those flaws characteristic of the *smaragdus** and in addition to certain specks called *ptergiae*. It is believed also that *berylli* are found in the kingdom of Pontus.⁷ The Indians, when crystal was found of a nature capable of being used to imitate and falsify other stones, used it to make imitation gems and particularly imitation *berylli*.⁸

* Emerald.



Chapter XXI

OPALUS AND ITS SUBSPECIES

The gem called *opalus**¹ differs but little or not at all from the *beryllus*: and yet *opalus* is something entirely different: nor is there a precious stone more admired than it is unless it is the *smaragdus*.* The land of India² is the only producer of this gem. Lovers of precious stones and writers of books on precious stones have called *opalus* the most valuable of all precious stones, largely because of the difficulty of determining and knowing how to describe it; for in the *opalus* you will see the refulgent fire of the *carbunculus*,* the glorious purple of the *amethystos*,* the sea green of the *smaragdus*,* and all these colors glittering together mixed in an incredible way.³ Some *opali* carry such a play within them that they equal the deepest and richest colors of painters. Others again simulate the flaming fire of burning sulphur, yet, and even the bright blaze of burning oil. The *opalus* is ordinarily as big as a filbert nut. And now for a story regarding this gem, worth repeating: for there is to be seen today the stone for which Marcus Antonius proscribed and outlawed Nonius,⁴ a Roman senator, the son of that Struma Nonius, who

* Opal.

* Emerald.

* Garnet.

* Amethyst.

* Emerald.

so got into the hair of Catullus, the poet, because he sat in the stately ivory curule chair: and the grandfather of that Servilius Nonianus who was consul in my lifetime. Now this senator, when he was forced to flee, being proscribed, took with him of all his goods only a single ring set with an *opalus*, which is a well-known fact, had been valued at 2,000,000 *sestertii* (say \$79,350). But as the cruel and uncontrollable greed of Antonius (who solely for a jewel outlawed and banished a Roman senator) was astounding on the one hand, so, on the other, was the childishness and the incorrigible obstinacy of Nonius, strange. For he so loved the gem which caused his proscription that rather than part with it, he permitted himself to be turned out of house, home, and country. In truth, wild beasts are wiser than he, for they bite off parts of their bodies and leave them behind for the hunters, when they see themselves in danger of death.



Chapter XXII

FLAWS OF OPALUS

As with other precious stones, the *opalus* has a number of flaws and imperfections; for example, if the color resembles the flower of the plant which is called *heliotropium*, if it contains crystals or hail-like particles, if it contains spots resembling kernels or grains of salt, if it is rough to the touch, or if in it there are small points or spots which are visible. There is no other precious stone which the Indians can so well counterfeit in glass as the *opalus*:¹ and after the counterfeiters have completed their work, scarcely anyone can tell the true *opalus* from the false. The only real test is by the sun, for if you hold an *opalus* with the thumb and forefinger against the sun's beams, provided the stone is a counterfeit, the various colors therein ap-

pear as one and the same transparent color, which is anchored in the body of the stone: while the brightness of the genuine *opalus* always changes and sends forth, more or less, its luster here and there and the glittering rays of light even shine on the fingers. This gem, on account of its rare and incomparable beauty and elegance, is by most writers called *paederos*.^{*2}

* Opal.

Some say that there is another kind of *opalus*, which the Indians call *sangenon*.^{*} It is also stated that *opali* occur in Egypt, in Arabia, and in the kingdom of Pontus but such command the lowest prices. They are also found in Galatia and in the islands, Thrasos, and Cyprus. While these have part of the delightful beauty of the *opalus*, yet their luster is not as animated and dancing, and rarely will you find one that is not rough. Their dominant colors incline toward that of copper and purple: and the velvety green of the *smaragdus*,^{*} which the finer *opalus* has, is absent. It is generally held that the most valuable *opali* are those verging on the color of wine rather than that of water.

* Opal.

* Emerald.



Chapter XXIII

SARDONYCHUS: ITS SUBSPECIES: ITS FLAWS

So far, I have treated of the principal gems and precious stones which are the most esteemed according to rules set down and determined by our elegant and rich women,¹ for we can depend on the taste of women, much more than we can on that of men, for men (kings especially and, after them, other high officials) establish the price of each gem according to their own whims. Claudius Caesar, the emperor, for example, would have only to do with the *smaragdus*^{*} and the *sardonychus*^{†2} and these he wore in his rings. But Scipio Africanus, as Demostratus tells us, preferred the *sardonychus* long before him, and was the first Roman to use this gem-

* Emerald.

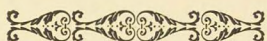
† Sardonyx.

* Carnelian, in part
sard.

* Onyx.

stone: and since that time it has been very popular at Rome.³ I, hence, place it next to *opalus*. Formerly, *sardonychus*, as its name indicates, was a *sarda** on a white background, as if it were the flesh under one's fingernails, both parts being clear and transparent. In reality, the *sardonychus* of India⁴ is such a stone according to Ismenias, Demostratus, Zenothemis, and Sotacus. The two latter call all such stones, which are not clear and transparent, "blind" *sardonychi*. Such are those which come from Arabia, and these properly are called *onychus*,* as they entirely lack the accompanying *sarda*. More recently these stones have been known by their respective colors, for some have a black ground or even one inclining toward blue, and are hence banded, for it is generally thought and believed that the lighter band of these stones not only has a tint of white but also a tendency to purple as if it were white inclined to vermillion or amethyst. Zenothemis writes that these stones were not in his time much regarded by the Indians. They were, however, so large that they were frequently used for sword handles and dagger holds, and this is not to be wondered at, for in India floods cause the mountain torrents to carry *sardonychi* down to the plains where men find them. He adds that formerly they were highly esteemed in India, since there is no other stone which imprints the wax so clearly without plucking any of it away, and for this reason the Indians valued it and took pleasure in wearing it. Today, the common people of India pierce⁵ *sardonychi* and wear them only in necklaces about their necks. Hence, it happens that stones which reach Rome are considered to be Indian *sardonychi* and *sarda*. As for the Arabic,⁶ the best are those which are surrounded by a white circle, the latter being very bright and narrow, nor does this circle glisten within the stone itself or on the sides of the gem, but only on the top, the ground mass being an intense black. The background of Indian *sardonychi* resembles wax or horn, or is white, which in instances resembles a dull rainbow, because of certain cloudy vapors apparently coming from it, but the other layer of the stone is redder than the shells of boiled

lobsters. All those *sardonychi* of the color of honey or wine lees, (for such colors are undesirable in *sardonychi*) are not prized: similarly if the white circle is irregular in shape. It is also held to be a great imperfection if there is a vein of another color than its own crossing one of the bands, for this stone like all other things cannot have any extraneous color disturb the symmetry of its layers. There are also Armenian *sardonychi* which would be valued highly, were it not for the pale circle that encloses them.



Chapter XXIV

ONYCHUS: ITS VARIETIES

I next describe *onychus*,* the namesake of *sardonychus*, for notwithstanding there is a stone of that name in Carmania (a variety of marble), a gem is also so named.¹ Sudines² writes that the precious stone, *onychus*, is white like a fingernail. It has in addition, he avers, the color of *chrysolithos*,* that of a *sarda*,† that of a *jaspis*.* Zenothemis states that the Indian *onychus* is of several and different colors, i.e., a fiery red, a black, and a horn gray. It has, in addition, certain white fibers or veins in the form of eyes enclosing it, although in some specimens these fibers or veins cross the stone. Sotacus describes an Arabian *onychus* which differs from other *onychi*, he says, because the Indian has glistening spots in it, while the Arabian is surrounded by one or several white circles. It is very different from the Indian species, for in the Indian the white appears as spots and in the Arabian as complete circles. As for the Arabian *onychi*,³ they are frequently black with white circles. Satyrus reports that the Indian *onychus* is flesh colored; that in one part it resembles a *carbunculus*,* in others *chrysolithos*,† and in another *amethystos*.* Yet, he does not admire these; but the

* Onyx.

* Topaz.
† Carnelian or sard.
* Jasper.

* Garnet, ruby, spinel and other transparent red gems.
† Topaz.
* Amethyst.

true *onychus*, he states, has many veins of different color. It is also adorned with circles as white as milk, and while the colors of the veins in *onychus* are not strong as one looks at the stone, yet these colors harmonize into a single effect restful to the eyes and producing a luster pleasing to look at.

Now that I have described *onychus*, I must not delay too long in describing the *sarda*, which forms the other half of the gem *sardonichus*. But before doing this I must write of those stones with an intense and fiery color.



Chapter XXV

CARBUNCULUS: ITS SUBSPECIES

* Garnet, ruby, spinel, and other transparent red gems.

* Ruby.

* Almandite.

* Garnet.

* Garnet.
† Almandite.

Almandite: spinel?

Among the red gems, the *carbunculus** holds first place and is most esteemed.¹ Its Greek name is derived from the stone's likeness to fire, and yet fire does not affect it, for which reason some call it² *apyroti*.^{*3} As to their varieties, there are the *carbunculi* of India* and those known as *garamantic*,* which are also called *carchedonian* that is,⁴ *carthaginian*, because their beauty reminds one of the wealth and power of the city, Carthage the Great. As of equal rank, some place the Aethiopian *carbunculi** and the Alabandic *carbunculi*,^{†5} which are found in the rugged sides of the hill Orthosia. These are shaped and cut to perfection by the Alabandians. In all kinds of *carbunculi* those are called male⁶ which show a more fiery red and, contrariwise, those that shine less brightly and more faintly are called female. Among the male, some have a clear and pure flame; others are darker and blacker. Some again shine brighter than all others and in the sun show a more marked and a more burning luster, but the very best are those called *amethystizontes** because on the crystal points their fire resembles the violet-blue of the

amethystos.^{*} The next in value are those called *syrtitae*,^{*7} and these glitter and shine even when uncut. As a result they are easily seen, wherever they occur in the ground, by the reflection of the sun's rays. As to Indian *carbunculi*, Satyrus says that they are rarely clean as found and indeed are usually befouled. But after they are freed of impurities their brightness is very fiery. He further states that the Aethiopian *carbunculi* are greasy and show no exterior luster but seem to have a fire burning within as if enclosed in the gem. Callistratus believed that if a *carbunculus* is laid upon an object it produces certain white clouds in the outside rim of the sparkling light the gem generates, but if it is held up to or is suspended in the air, it is lustrous and gives out red fire. For that reason most authorities call it the white *carbunculus*. Similarly they have named those Indian *carbunculi* which shine less decidedly and with a brownish or dusky flame, *lithizontes*. As for the Carchedonian *carbunculi*, Callistratus says they are the smallest of all. On the other hand, some Indian *carbunculi* are so large that being hollowed into vases, the later contain as much as one *sextarius*⁸ (almost a pint). Archelaus writes that the Carchedonian *carbunculi* are darker colored than other varieties, but if exposed to fire or to the sun and held obliquely, they are more brilliant and fiery than all other varieties. These in a darkened house seem purple and in the open air, held toward the sun's rays, brilliant. He further claims that the fiery heat of these stones is so real that if a man use them as a signet, even in a shaded and cool place, they nevertheless melt the wax. Many authors state that the Indian *carbunculi* are paler than the Carchedonian, and that contrary to the characters of the Carchedonian, if viewed obliquely they lose much of their fire and appear dimmer and duller: also that in the male Carchedonian^{*9} *carbunculi* certain rays, like stars, twinkle within: whereas the female, on the contrary, throws all its fire outward: further, that the *carbunculi* of Alabanda are darker than others and blackish and have a rough exterior. It is also said that certain stones are found in Thracia of the same color as

* Amethyst.
* Garnet.

* Star Garnet?

carbunculi and these are not charred nor do they become hot in a fire. Theophrastus¹⁰ states that *carbunculi* are found near Orchomenus in Arcadia, as well as in the isle of Chios. The first are dark-colored and mirrors are made of them. The Troezenian *carbunculi*, he adds, are of different colors and show small white spots, further that the Corinthian *carbunculi* are paler and whiter than other varieties. He says *carbunculi* are also found at Massilia.¹¹ Bocchus writes that *carbunculi* are found at Olisipo,¹² but they are very hard¹³ to find and mine since they are imbedded in clay in certain deserts and forests burnt with the sun.



Chapter XXVI

FLAWS OF CARBUNCULUS: THE METHOD OF TESTING IT

In resumé, there is nothing more difficult than to attempt to distinguish these various kinds of *carbunculi* from one another. Further, they are easy to counterfeit and falsify by the art and skill of lapidaries and goldsmiths who put a foil beneath them to make them brilliant and glitter like fire. Some say that the Aethiopians steep their dusky and dark *carbunculi* in vinegar. As a result, in fourteen days, they become pure and lively and remain so for fourteen months. *Carbunculi* are imitated by glass and such imitations at first sight are excellent: but by grinding on a mill, the fraud is immediately discovered as is true with any other artificial or false stone: for the substance of the latter is softer and more brittle than that of the true gem. Further, false *carbunculi* are detected by the lack of hardness of their powder and by their weight: for glass imitations are the lighter of the two. Further, one sees in false *carbunculi* certain small inclusions, that is blisters and vesicules, which look like silver.

Chapter XXVII

ANTHRACITIS

There is found in Thesprotia a *carbunculus* called *anthracitis*,^{*1} resembling coals afire. While some authors report that this variety is found also in Liguria, I believe it untrue, unless in times now past it may have been found there. It is further said that some *carbunculi* of this kind are surrounded by a white vein although their color is as fiery as the others; and they alone have this characteristic that, being thrown into the fire, they become lifeless and lose their luster. On the other hand, if they are well sprinkled with water they glow and again glitter.

* Garnet largely. Some ruby included?



Chapter XXVIII

SANDASTROS

There is a stone much like the *carbunculus* called *sandastros*,^{*} also called by others *garamantites*, which occurs in a place in India of that name. It also occurs in that part of Arabia facing the South sun (i.e., Southern Arabia). It depends for its beauty upon its transparency and the fact that within are certain particles, as it were, of gold which shine like stars. These occur only in the interior of the stone and not on the surface. Because of these stars, which resemble the heavenly ones, the stone is supposed to be of ritualistic value, for they are believed to represent the seven stars called Hyades, both in number and in position. For this reason, the wise men of Assyria,² called Chaldaei, prize them greatly. The *sandastros* is also divided as to sex,³ the male having a stronger and deeper color, and by the reflection of their internal fire, color those things that they touch or are near. The Indian variety of this

* Aventurine quartz.

stone, by its brilliance, is said to dim the eyesight. The female *sandastros* disperses less fire and is more pleasant to the eye, since it is attractive rather than burning. Some writers prefer the Arabian *sandastros* to the Indian, stating that the Arabian resembles the *chrysolithos*,* i.e., its color is slightly smoky. Ismenias says the *sandastros** is so brittle it cannot be polished. Those authors who call this stone *sandaresos* err. All authors agree that the more stars that occur in the male stone, the higher is its price.⁴ Further, it should be noted that the similarity of names is the cause of error, as we may see by *sandaser*, which Nicander called *sandaserion*, and still others, *sandaseron*. Some consider the latter *sandastros* and the former *sandaresos*, which, later called by Nicander *sandaserion*,* is found in India and is named from the place where it occurs. In color it resembles an apple or, again, green oil. Finally, its price is low.

* Topaz.

* Aventurine feldspar??

* Green aventurine quartz? In part, green jasper??



Chapter XXIX

LYCHNIS

*Lychnis** so called¹ from² its resemblance to the flame of a candle, accounting for its unusual beauty and its rich appearance, can well be placed among those fiery and burning stones. It is found near Orthosia and everywhere in Caria and nearby places, but the best comes from India, which some claim, in reality, is a weakly colored *carbunculus*. Of less esteem and value than *lychnis* is *ionis*,* so named after the March violet, because of the close similarity in color of the two. Other kinds of *carbunculi*, differing from those already described, are mentioned. Some of them are of the clear and glorious purple of lac; others are crimson or scarlet. These, when heated, draw to them chaff, straws, threads, and paper shreds.

* Red tourmaline? Reddish yellow quartz??

* Amethyst??

Chapter XXX

CARCHEDONIA

The *carchedonia** is said to have the same property, although it is inferior in price to that just described. These gems are found among the hills inhabited by the Nasamones¹ and, according to that people, are formed from a divine dew or a heavenly rain shower.^{2 3} They are found twinkling in the moonlight, especially when the moon is full.⁴ In olden times, the trade in these gems was at Carthage; hence their name. But Archelaus says that they are also found in Egypt near the City of Thebes.* However, the latter are brittle, full of fractures and resemble a coal which is ready to die. I find that drinking cups are made not only of it but also of *lychnites*.* In general, all *carbunculi* are very hard to cut and they have the undesirable quality that they never seal clean since some of the wax sticks to the signet.

* Garnet?

* Veined red jasper??

* Translucent marble??



Chapter XXXI

SARDA: ITS VARIETIES

On the other hand, *sarda** seals well and no wax sticks to it. The *sarda* forms part of the name *sardonychus*. This stone, which is very common, was first found near Sardis.^{1 2 3} Now, however, the principal source is Babylonia where, in certain quarries, it is found sticking out of the rock like a heart. It is said that the Persians got *sarda* here, but the mine is now practically exhausted. It is, however, found in many other places including Paros and Assos. From India three different kinds are sent, namely the red, the suet-like variety (called *demium*), and a third which ordinarily has a silver foil placed beneath it to add to its

* Largely carnelian: in part sard.

luster. The Indian *sarda* is transparent and light passes through it; the Arabian is less transparent. Others are found in Egypt and a gold foil is normally used with them. These gems are also divided as to sex. The males have a more brilliant and a brighter luster: the females are not so resplendent and shine as if through an oily, fatty substance. In ancient times there was no gem more esteemed than the *sarda*.⁴ In truth,⁵ Menander and Philemon mention it in their comedies as a fine and valuable gem. Nor can we find any other precious stone which maintains its luster longer than it does against any moisture with which it is in contact. Oil, however, acts more readily on it than any other liquid.⁶ To conclude this section, *sarda* of the color of honey is but little esteemed and there is little demand for it. Those of the color of earthen pots are even less valued.



Chapter XXXII

TOPAZOS: ITS VARIETIES

* Olivine.

*Topazos**¹ has its own shade of green for which it is highly prized. When it was first found it surpassed all other precious stones in price.² The *topazos* was first found in a Red Sea Island called Chitis. Here certain pirates landed, they having been driven there by adverse winds. Being in a famished condition, they fed on herbs and on roots which they dug from the sand. In so doing they found the *topazos*. I quote this from Archelaus. But King Juba³ ⁴ says that in the Red Sea there is an island called *Topazos*,⁵ three hundred *stadia* from the mainland, and at times this is so surrounded by fogs that sailors have difficulty finding it, hence its name. According to him, in the language of the Troglodytes, *topazin* means to search or seek for an object. It is said that the first admirer of the gem was

Queen Berenice, the mother of Ptolemy the Second, since Philon (her son's governor in that part of Egypt) had given her one of these stones. Of *topazos*, Ptolemy Philadelphus, king of Egypt, later had made a statue of his wife Arsinoe which was four cubits long:⁶ and in her honor he dedicated it in a chapel called the "golden temple." Modern writers state that this gem is found near Alabastrum, a town in Thebais, a province of Upper Egypt. There are two varieties of *topazos*, namely *prasoides** and *chrysopteron*.† The later resembles the stone called *chrysoprasus** as the color of both is that of the juice of the root called leek. *Topazos* of all precious stones is the largest; in this it excels all other gems. It is polished with the iron file, while all other precious stones require emery stone. It is a precious stone which wears with usage.⁷

* Peridot.
† Chrysolite.
* Chrysoprase.



Chapter XXXIII

CALLAINA

Topazos,* so far as color is concerned, is to be classed with *callaina**¹ for the latter is green² inclining to yellow. It comes from beyond farthest India among the inhabitants of the Caucasus Mountains, called the Phycarians and the Asdates.³ The stone is of considerable size but it is a porous growth, full of flaws. The purest and finest come from Carmania. In both countries the gem occurs in icy cliffs which are accessible only with the greatest difficulty. From these the *callaina* protrudes in semiglobular masses like eyes.⁴ The gems adhere to these crags and rocks so slightly that one would be inclined to say that they scarcely grew there naturally but were set there by man's hand. The place where they occur is so steep that a horseman⁵ cannot ride up to it, and as the local people have no love for mountain climbing, being only accustomed to life

* Olivine.
* Greenish turquoise.

on a horse, they do not dare to climb up for the gems. They, therefore, from a distance attack the gems with slings and so shoot them down, together with the hard moss which occurs near them. In reality, *callaina* as a commodity is a source of great revenue⁶ to them and their own wealthy men⁷ prefer to wear it about their necks more than any other gem. By the size and quality of the collar or chain of *callaina*,⁸ the wealth, small or great, of these men is judged, and it is the boast of these tribesmen that from their childhood they have dislodged so many *callaina* with their slings. Yet in practicing this art, all do not fare alike; for some at the first attempt knock down many *callaina* and others wear their fingers to the bone and never get one *callaina*. Such is the method of chasing or, if you prefer, hunting *callaina*. Once recovered, they are sent to the lapidary to be cut and shaped into the form desired. As a matter of fact the stone is soft and easy to cut. The best *callaina* is the one which approaches nearest to the grass green of the *smaragdus*;^{*} that is, the greatest beauty attainable by *callaina* belongs to another gem. Set in gold, they attain full perfection and no other gem harmonizes so well with gold.⁹ The better *callaina* is, the sooner it loses its color, if in contact with oil, unguents, or wine.¹⁰ On the other hand, the poorer the quality of the stone, the better it retains its color and luster. There is no other precious stone anywhere which can be imitated so easily in glass. Lastly, let us add that some writers claim that *callaina* is found in Arabia¹¹ in the nests of certain birds called *melacoryphi*, that is black caps.¹²

* Emerald.



Chapter XXXIV

PRASIUS: CHRYSOPRASIUS

* Plasma or prase.

Regarding green stones, there are many kinds. Among the commoner varieties, one of the color of leek we call *prasius*.^{*} The first species is green; the second

in the green has certain blood red spots* which cause it to be unpleasant to the eye and rough on the surface; the third is green divided by three white streaks.*

The stone *chrysoprasius*,* of sea water or hoarhound green, is preferred to *prasius*.* In a way it resembles the green juice of the leek but it differs somewhat from the color of the *topazos*,* being between that color and gold. *Chrysoprasius* sometimes is found so large that drinking cups in the shape of boats are made from it! And, indeed, pilasters and columns.

* Bloodstone or heliotrope.

* Banded Green chalcidony.

* Chrysoprase?

* Plasma or prase.

* Olivine.



Chapter XXXV

NILION

This stone is found in India, as is another stone called *nilion*.* The latter has a weak and noncontinuous luster, for if one observes it for a time, one will find that its luster quickly fades. Sudines says it is found in the Syverus, a river which flows through the country of Attica. In color it resembles a smoky *topazos** or, again, it is of a honey color. King Juba states that it occurs in Aethiopia on the banks of the Nile River, hence its name *nilion*.

* Green jasper or plasma?

* Olivine.



Chapter XXXVI

MOLOCHITIS

There is a stone called *molochitis*,* since¹ its green color resembles that of a mallow, and it is less transparent than those previously described.² It is an excellent material for signets and it seals wax well. Further, it is supposed to have the virtue as a countercharm to ward off from babes all forms of witchcraft and sorcery.³

* Malachite.

Chapter XXXVII

JASPI: ITS MANY VARIETIES:
ITS IMPERFECTIONS

* Jasper, predominantly green.

* Green jasper; in part jade.

* Sapphirine variety of chalcedony.

* Lapis Lazuli.

* Emerald.

* Sapphirine variety of chalcedony.

† Carnelian, in part sard.

* Rock crystal.

* Yellowish banded jasper.

There is also a species of gemstone *jaspis** that is green.^{1 2 3} It is frequently transparent and while there are many stones that excel it, yet it still retains the old place and position that it formerly had. It is found in many places. That of India* is like *smaragdus*. The *jaspis* of Cyprus is very hard and of a greasy gray color, between white and green. The Persians send us a *jaspis*, blue as the sky and therefore called *aerizusa*,*⁴ and a similar stone comes from the hills along the Caspian.

The *jaspis* found near the river Thermedoon is blue as *sapphiros*.* In Phrygia a purple variety is found; in Cappadocia one partly purple and partly blue but wholly lacking in luster. We import *jaspis* resembling that of India from Amises, a city of Pontus.⁵ The *jaspis* of Chalcedon is muddy looking and flawed. But it is preferable to describe the better varieties of *jaspis* rather than to list the countries in which the stone occurs. The most highly esteemed *jaspis* is that which tends to a purple or the color of lac. The second is of a flesh or a rose color. The third in its greenness resembles the *smaragdus*.* To each of the several kinds the Greeks have assigned appropriate names. They have assigned the fourth place to that called *boria*, resembling the morning sky in autumn. It is also well named *aerizusa*.* There is a *jaspis* of the color of *sarda*,† and another in color approaching violet. There are many other varieties, not mentioned here but all are subject to many blemishes; i.e., being blue or verging toward *crystallus*,* or of a watery appearance. Last of all we have the *jaspis* which the Greeks call *terebinthizusa*,* a name improperly used I believe, indicating as it does that it is made up of many gems of the *jaspis* family. The better gems of this species are mounted in a circle of gold leaving both the top and bottom of the stone exposed, the gold merely forming

a ring around it. The blemishes of *jaspis* are as follows: if the luster does not continue, although the stone from a distance is seen to glitter; or if the stone shows a spot like a grain of salt: in addition, it has all the other faults of other gems which I have mentioned before. *Jaspis* may be imitated in glass. This is quickly detected as the imitations reflect the luster outwardly and do not retain it within the stone. As to the stone called *sphragis*,* it is not unlike⁶ *jaspis*. It, above all other stones, makes the best signets since it seals the wax perfectly.

Of the different sorts of *jaspis*, the people of the East, according to report, prefer that resembling *smaragdus** and they carry it about them as a charm.⁷ This, if it is crossed by a white line in the middle, is called *monogrammos*,* if with many lines, *polygrammos*.† And now I can no longer keep silent. I must give the lie to the magicians who state that this stone is a very good charm to be possessed by one about to make a public speech or an oration to the populace. Further, there is a *jaspis* called *onycho-puncta** and *jasponyx** which seems to have within it a cloud which in some sorts resembles snow. This *jaspis* is formed like a star and within are different red points. One looking on it would say it were a kind of Megarian salt. There is also a *jaspis* which looks as if it were filled with smoke: this is called *capnias*.* As to the size which *jaspis* attains, I have seen one nine inches long cut into a statuette of the Emperor Nero, standing armed and wearing a cuirass.



Chapter XXXVIII

CYANOS

As to the precious stone *cyanos*,* I must describe it separately notwithstanding that the name is sometimes used for a species of *jaspis*. The best comes from *Seythia*, the next best from *Cyprus*, and the poorest

* Ordinary jasper.

* Emerald.

* Banded jasper.

† Banded jasper.

* Interbanded jasper and onyx.

* Brownish jasper.

* Azurite.

Blue

* Lapis lazuli.

from Egypt. This stone is frequently imitated* and especially by coloring other substances.¹ This invention is ascribed to an Egyptian king who obtained a great reputation as being the first who accomplished it. This stone also has sex, for there is both a male and a female. Further, there occurs in it a certain powder of a golden color and yet not like that of *sapphiros*;* for the latter stone also glitters with particles and spots of gold.



Chapter XXXIX

SAPPHIROS

* Lapis lazuli.

*Sapphiros**¹ contains spots like gold. It is also sometimes blue, although sometimes, and indeed rarely, blue tinged with purple. The best comes from the country of the Medes. It is never transparent. Further, *sapphiros* is difficult to cut and engrave since the lapidary encounters hard spots of mineral scattered in it.^{2 3 4} The most intensely blue are the male.



Chapter XL

AMETHYSTOS: ITS VARIETIES

* Amethyst: in part purple sapphire?

I will next describe the stones of a purple color, some of which deviate somewhat from this color and yet seem to belong to this family. In the first rank of these I must place the *amethystos** of India, and of those found in that part of Arabia adjoining Syria which is called Petraea. They further occur in Armenia Minor, in Egypt, and in Galatia, but the most flawed and basest sort are those of Thasos and Cyprus. The general

opinion as to the origin of the name¹ *amethystos* is from wine as the stone approaches the color of wine yet before it really attains that tint it turns into the color of a March violet. Others say that the purple luster it has is not firmly fixed, but in the end changes to the color of wine. There is no *amethystos* that is not transparent and of a violet color. All are easy to cut and to engrave. The Indian *amethystos* has the full and rich color of the Phoenician purple dye: indeed it is the aim of the dyers to produce a color equal to that of *amethystos*. The stone is indeed pleasing to the eye: nor does it strike and pierce the sight so strongly as does the *carbunculus*.^{*} In the second rank is that *amethystos* which inclines toward the *hyacinthos*.^{*} This color the Indians call *sacon* and the gem itself *sacondion*.^{*} Should the color be less intense and more feeble, they call the stone *sapenos*.^{*} The third stone of this tint is called *pharanites*^{*} and it comes from the frontiers of Arabia, the name being derived from a tribe living there. The fourth kind^{*} resembles the color of wine. The fifth variety^{*} resembles *crystallus*† except its basal part is a pale purple:³ but this variety is not at all esteemed. Fine *amethystos*, being held up in the air, should shine like a *carbunculus* with a purple luster, slightly inclining to a flesh or rose color. Such an *amethystos* some prefer to call *paederos*,^{*4} *opate*, or *anterotes*.^{*} Further, many call it the gem of Venus because of its beauty and the modest loveliness of its color. The magicians, as arrogant in this as in all things, would have us believe the stone has the special virtue of helping man escape drunkenness,⁵ for which reason the stone is called *amethystos*. They are not even content with this but further contend that if the image of the moon or the sun be engraved on the stone and it be hung about the neck either with the hairs from a baboon's head or by swallow's feathers, it is a sovereign remedy against all charms and sorceries connected with poisoning. Further, they would have us believe that the stone assures the owner the favor of princes,⁶ if one has business with them, and that the stone gives one easy access to their presence, and their

* Garnet, ruby, spinel, and other red gems.
* Sapphire.

* Amethyst.

* Amethyst?

* Amethyst?

* Amethyst?

* Inferior amethyst.
† Rock crystal.

* Amethyst?

* Amethyst?

favor. Further, they state that the stone has the power of averting hail and other similar vagaries of the weather, also the power to turn away locusts, but to complete the charm a prayer must be said, the exact wording of which they set down. But why be surprised since they promise similar things of the *smaragdus** if engraved with eagles or with beetles. In putting down such conceits and vanities, the magicians well show not only the contempt in which they hold mankind, but also their habit of mocking the world.

* Emerald.



Chapter XLI

HYACINTHOS

Next in order, we will speak of the *hyacinthos*.^{*1} While it differs markedly in some respects from the *amethystos*,* in luster at least the two stones are much alike, indeed the only difference between them is that in the *amethystos* the violet color is strong and rich, in the *hyacinthos* it is diluted and weaker. The *hyacinthos* at first sight is pleasant and esteemed, but its lovely beauty vanishes before the observer is satisfied. Indeed, it is far from contenting the eye completely and satisfying its pleasure since the color fades sooner than that of the dainty flower also called *hyacinthos*, and the luster weakens rapidly, almost before it comes to the eye.

* Sapphire.

* Amethyst.



Chapter XLII

CHRYSOLITHOS: ITS VARIETIES

Aethiopia furnishes us with both *hyacinthos** and *chrysolithos*.* The latter¹ is transparent and the color of gold. The *chrysolithos* of India is preferred to that of Aethiopia² and also that of Bactriana,³ if it is not spotted.

* Sapphire.

* Topaz.

and flecked with different colors. The worst of all varieties is that of Arabia, for it is not only mottled in color, but turbid and flawed, and such radiant luster as it has is interrupted with clouds or spots; and if by chance it is in other particulars clear, yet one looking at it would say that it was full of its own dust.⁴ The best *chrysolithi* are those which, being mounted in gold, by comparison cause the latter to appear of a whitish hue like silver.⁵ Such as are clear and transparent, jewelers mount in a hoop of gold so that both top and bottom may be seen. The others require a foil of a copper compound,⁶ or a related substance, to give them luster.



Chapter XLIII

CHRYSELECTRUM

Today some who are not skilled gem experts have begun to name a number of varieties of *chrysolithos*.^{*} *Chryselectrum*,^{*} for example, for those which incline to the color of unrefined gold called *electrum*, and such in the morning is more beautiful and pleasing to the eye than it is all the rest of the day. Stones of this species which come from Pontus are known because they are so light in weight.¹ Some of them are hard and of an orange-red color, others are soft and full of extraneous matter. My author, Bocchus, states that they are also found in Spain in a place where the inhabitants sink pits to water level, from which the peasants also mine *crystallus*.^{*} He adds that he has seen such a stone which weighed twelve pounds.

* Topaz.

* Citrine.

* Rock crystal.



A ROMAN BOOK ON PRECIOUS STONES

Chapter XLIV

LEUCOCHRYSOS

Stones of this kind, with a white vein parting them, are called *leucochrysi*.^{*} Smaller stones of this kind are called *caprias*.^{*1} They resemble beads, but are of a shining yellow color like saffron. And, in reality, these stones are counterfeited in glass so cleverly that the eye can scarcely detect the deception, but if you handle and feel them, you will soon discover the villainy, for the stones are colder than the false gems.

* Inferior topaz??

* Smoky quartz.



Chapter XLV

MELICHRYSOS: XUTHON

In this group of gems I may well include the stone which is called *melichrysos*.^{*} It looks like clear honey shining through gold. It comes from India, but of all gems it is most subject to injury and is the first to fracture. The same country produces also a gem called *xuthon*,^{*} which is so common that even the ordinary people wear it.

* Chrysoberyl cat's-eye.

* Yellow jasper?



Chapter XLVI

PAEDEROS AND RELATED STONES

Speaking of white gems, the chief of them is that named *paederos*.^{*} Under that name they include fair and beautiful stones (such a power has the word to signify supreme loveliness). One may properly question how the name can be confined to a single gem or even to one color; yet there is undoubtedly a kind of precious stone called *paederos* and it is certainly worthy of the name. In it there seem to merge the color of the

* Precious opal.

sky, the same having a greenish tint, with a clear and transparent *crystallus*.^{*} These tints are accompanied by a purple and a certain yellow and bright gold color of muscat: and it is always the last color that appears on the surface that gives the luster. Yet, one looking on it steadfastly would say that it is crowned with a purple chaplet: in short, it appears to have all these colors mixed together, since each color appears to have its own reflection. There is no other gem more pure and clear and it is pleasing to the eye. The best comes from India and the Indians call it *argenon*.^{*} Of less rank, is that of Egypt where it is called *senites*.^{*} A third variety of poor quality comes from Arabia. Those of Natolia and the kingdom of Pontus are not so brilliant nor as lively as the others. Those from Galatia, Thracia, and Cyprus are still less lustrous. You should know the blemishes which characterize *paederos*: they have too little brilliancy and the presence of colors not characteristic of the gem. In addition, they are subject to the defects and imperfections of other gems.

* Rock crystal.

* Precious opal.

* Inferior opal.



Chapter XLVII

ASTERIA

Asteria^{*} should be placed in the second rank of white gems: but it has a wonderful property for which it deserves a higher rank. Enclosed in it is a light¹ like the pupil of the eye which, as one holds and turns the stone, the pupil changes its position and moves from its original place. One would think that it ran and jumped from place to place. If held against the rays of the sun it casts forth bright and white rays of its own, like a star, from which it took the name *asteria*. It is very difficult to engrave. Those from India are preferred to those from Carmania.^{*}

* Star sapphire.

* Girsol opal?



Chapter XLVIII

ASTRION

- * Moonstone?
- * Rock crystal.

There is also a white stone called *astrion*,* resembling *crystallus*.* This comes from India and the coasts of Pallene. From the exact center of the stone there shines a kind of star in the manner of a full moon in the height of her brightness. Some explain its name because if held against any star it receives from it a ray of light which the stone then returns. The best is said to come from Carmania and there is no other gem of this kind which is less subject to blemishes and imperfections. A poor kind of this stone is called *ceraunia*,* and the worst of all varieties resembles the blaze or flame of lamps or candles.

- * Inferior moonstone? or satinspar??



Chapter XLIX

ASTROITES

- * Fossil coral.

As to *astroites*,* many people value it highly. Those that have written most about it declare that Zoroaster held it in esteem and told of its magical properties.



Chapter L

ASTROBOLOS

- * Quartz cat's-eye or moonstone?

Sudines mentions another gem called *astrobolos*.* He says it is like the eye of a fish and, if held against the sun, it casts out brilliant white rays.¹



Chapter LI

CERAUNIA: ITS VARIETIES

Among white gems may be also mentioned that called *ceraunia** which receives light and luster from not only the sun and the moon but also from the stars.¹ It resembles clear *crystallus** although the reflections from it seem to be of an azure blue color. Zenothemis tells us that it comes from Carmania. He adds it is a white gem and has in its interior a starlike fire which appears to move to and fro, as one turns the stone. He further states that the *ceraunia* may become dull and dusky. In this case it is soaked for a certain number of days in vinegar and nitre.² It then recovers its luster and gains a new fire in the form of a star, and this continues to shine as many months as it was days in the solution: and thereafter it loses its luster once more. Sotacus describes two more varieties of *ceraunia*, the black³ and the red, stating that they resemble in shape a halberd or an axhead.⁴ He informs us that the black, particularly if it is round, has this virtue that by it cities may be won and navies at sea overcome: but these are called *betuli** of which the less spherical alone are correctly called *cerauniae*.

There is still another *ceraunia* it is said, but it is very rare and hard to find. The Parthian magicians esteem it greatly, and they claim they alone can find it for it occurs where a thunderbolt has struck.*



Chapter LII

IRIS: IRITIS

Next after the *ceraunia* I will describe the stone called *iris*.* It is dug out of the ground on an island in the Red Sea, sixty miles from the city of Berenice. In most respects it resembles *crystallus**¹ and for this reason some call it the root of crystal.² The reason it is

* Inferior moonstone?
or satinspar??

* Rock crystal.

* Prehistoric axes.

* Meteorite.

* Prehistoric axes or
arrowheads.

* Iris.

* Rock crystal.

called *iris* is that if the sun's rays strike it directly in the house, it sends against the nearby walls a replica both in form and in color of a rainbow. From time to time the rainbow varies, to the delight of all who see it. It is well established that the stone has six angles like the *crystallus*:* but it is said that some of the faces are rough and that the iris is unequally angled. This stone, if laid in the sun, in the open air, scatters the rays of the sun which strike it, too and fro. Again, it generates a brightness which lights up whatever is near it. As for the different colors which the stone gives out, this only occurs in a dark and shady place; from which we know that the variety of colors is not in the *iris* but is derived by reflection from the walls. The best *iris* is that which makes the largest arc on the wall and, as the latter, most closely resembles the rainbow. There is another gem called *iritis** like the other except it is very hard. Orus in his books says that, calcined and pulverized, it is a sovereign remedy against the bite of an *ichneumon*: further that *iritis* is found in Persia.

* Rock crystal.

* Iris?



Chapter LIII

LEROS

Much like *iris* in form and shape is another stone called *leros*.* One seeing it would take it to be *crystallus** with a black band traversing it.

* A variety of crystal-
lized quartz.
* Rock crystal.



Chapter LIV

STONES ALPHABETICALLY ARRANGED ACHATES, ETC.

Having described the precious stones and jewels, according to their principal colors,¹ I will describe the rest in alphabetical order.

* Agate.

The *achates**² was in older times highly valued³ but

now it is cheap. It was first found in Sicily near the river also called Achates.⁴ Later it was found in many places. It occurs in large masses⁵ and in various colors, hence its numerous names: *iaspisachates*,* *cerachates*,†⁶ *smaragdachates** (as if the veins thereof resembled a little tree), *haemachates*,* *leucachates*,† and *dendrachates*.⁷ As to the variety called *autachates*, as it is burned it gives off a smell like that of myrrh. This is a reddish variety resembling coral, hence it is called *coralloachates*:⁸ and the same is spotted with gold as is the *saphiрос*.* This variety occurs frequently in Candia where it is called the holy or sacred agate: for according to the common people it is a cure for the sting of poisonous spiders and of scorpions.⁹ This property I could well believe the Sicilian *achates* has, for as soon as scorpions breathe the air of the Roman province of Sicily, no matter how venomous they may be, they immediately die. The Indian *achates**¹⁰ has the same properties and many other wonderful ones besides; for on them you will find represented rivers, woods, and farm horses; and one can see in them coaches, small chariots, and horse litters and in addition the fittings and trappings of horses. Physicians make *achates* mortars with which they reduce their drugs to fine powder.¹¹ It is believed that to look on the *achates* rests the eyes. If held in the mouth *achates* quenches and allays the thirst.¹² Phrygian *achates* has no green in it. That from near Thebes in Egypt has no red or white veins. It also protects against scorpions.⁹ The Cyprian *achates* has the same virtue. Some insist that the supreme beauty and value of the *achates* is for it to be clear and transparent like glass. Those found in Thrace and near the mountain Oeta, upon Mount Parnassus, in the isle of Lesbos and in Mesene, have the image of flowers, such as grown in the highways and the paths in the fields. Similar ones come from the isle of Rhodes. But the magicians know of numerous other sorts: those that resemble a lion's skin are reputed to be potent against scorpions. In Persia they believe that the perfume of *achates* turns away tempests and other unusual storms, and it also subdues violent river floods. To determine which stones are

* Agate-jasper.

† Chalcedony.

* Green agate.

* Red agate or agate with red jasper veins or spots.

† Chalcedony.

* Moss agate.

* Red agate? Fossilized coral??

* Lapis luzuli.

* Moss agate.

proper for this purpose the magicians throw them into a cauldron of boiling water.¹³ If they cool the same, it is certain that they are suited for the above-named purpose. But to be efficacious they must be worn tied by the hair of a lion's mane. Those *achates*, however, which display the pattern of a hyena's hide, the magicians cannot abide, as they cause dissension in the home. They also hold that provided a wrestler wears an *achates*, all of a color, he becomes invincible.¹⁴ As a test of this they put it and the different colors used by painters into a pot of seething oil. After it has boiled therein for two hours it will, provided it is genuine, impart to the oil and paints the color of vermillion. So much for the *achates*.

The stone called *acopis* resembles nitre. It is hollow and light like pumice stone although spotted with golden drops, or spots, like stars. Boil it gently in oil, then anoint the body with it and all weariness and lassitude depart, provided the magicians are to be believed.

The stone *alabastrites**¹⁵ is found about Alabastrum in Egypt, and Damascus in Syria. It is white mixed with sundry other colors. This, calcined with rock salt and then powdered, corrects halitosis and odors of the teeth.

In the craw of cocks there are found stones called *alectoriae**¹⁶ which resemble *crystallus*† and are the size of beans. Milo, the famous wrestler of Crotona, was accustomed to carrying one of these stones which rendered him invincible in whatever tournament he entered, or so the magicians inform us.

*Androdamos** is a stone of a bright color like silver and in form like an *adamas**, square and always growing in a tabular, lozenge-like form. The magicians state that it took the name because it controls the anger and the furious violence of men.

As to *argyrodamus**, whether it is the same stone as the last or another, authors do not inform us.

*Antipathes**¹⁷ is black and opaque. To test whether it is genuine, boil in milk for if it is in reality *antipathes* as soon as it is put in it, the milk looks like myrrh. The

* Alabaster.

* A crystal or stone
swallowed by cock
its calculi.
† Rock crystal.

* Galena? Specular
hematite??
* Diamond.

* Talc??

* Jet??

magicians would have us believe that it is a charm against witchcraft and especially against the evil eye.

*Arabica** closely resembles ivory and might be taken for it were it not so hard that it is evidently a stone. Those who wear it will not suffer from tired muscles.

The stone *aromatites** is found principally in Arabia, but also near Phirae in Egypt. But irrespective of its source, it is a hard stone and in color and smell resembles myrrh. Hence, it is much used by queens and women of position.

*Asbestos** occurs in the mountains of Arcadia and is of an iron gray color.

Democritus says that *aspisatis** comes from Arabia and is red. He adds that, tied with a camel's hair, it should be worn by those troubled with hardening of the spleen. Further, if you can believe him, it is found in the nest of certain Arabian birds.

Another stone of the same name is found in Cape Leucopetra but it is of a silver color and is lustrous. If worn, it is excellent against fantastic fears and dreams suffered in the night.

This same Democritus says that in Persia, India, and Mount Ida a stone is found called *atizoe** which shines like silver. It is three fingers thick, has the form of a lentil, and has a pleasant and delightful odor. The wise men of Persia never arrange for the naming and the coronation of a king without having it near them.

Many believe that *augites** is the same as *callaina*.†

*Amphitane**¹⁸ is a stone called also chrysocolla. It is found in that part of India where the flying ants mine gold. It resembles gold and in shape is cubical. It is said to have the same power as loadstone, but that in addition it attracts not only gold but silver.

Aphrodisiaca is in part white and in part red.

*Apsyctos**¹⁹ once heated in the fire remains hot for seven nights. It is black and heavy, certain veins divide it: it is good against colds.

As to *aegyptilla**, Iacchus says it is a white stone intersected by veins of *sarda** and a black stone. Most authorities consider the stone blue with a black spot at the bottom.

* Chalcedony.

* Ambergis?

* Asbestos.

* Garnet?

* Bezoar??

* Turquoise??

† Greenish turquoise.

* Chrysocolla or malachite with sulphide remnants or auriferous pyrite?

* Coal?

* Nicolo.

* Carnelian, in part sard.

Chapter LV

BALANITES, ETC.

* Pentremite??

There are two kinds of *balanites*.^{*1} One green and resembling Corinthian bronze comes from Coptos: the other, which has a red vein cutting it in the middle, originates in Troglodyte.

Coptos furnishes us other stones including those called *batrachitis*: one the color of a frog, the second of ivory, and the third blackish red.

* Stained amber.

*Baptēs** is soft and tender but has an excellent odor.

* Quartz cat's-eye?
Eye agate??

*Belioculus** is a white stone and has within it a black center which shines like gold. Because of its beauty this stone is dedicated to Belus, the most important god of the Assyrians.

There is another stone called *belus* which according to Democritus comes from the vicinity of Arbela. It is the size of a walnut and looks like glass.

Baroptenus or *barippe* is black with spots of white and blood red color, interlaced in a wonderful manner.

* Botryoidal hematite?

*Botryitis** is sometimes black, sometimes red, and in shape it is like a cluster of grapes when they start to form.

A stone which resembles the hair of women, Zoroaster names *bostrychitis*.

* Cast of fossil bivalve?

*Bucardia** has the form of the heart of an ox and is found only near Babylon.

* Prehistoric stone arrowheads?

Brontea^{*2} has the shape of a tortoise's head. It comes to earth with a stroke of thunder from heaven (as is believed). If one is credulous, it can put out the lightning's fire.

Bolos is found after a great storm or tempest and resembles a clod of earth.



The 37th Book of Pliny the Elder

Chapter LVI

CADMITIS, ETC.

*Cadmitis** and *ostracitis* are one and the same although the first named is surrounded with blue blisters.

*Callais** resembles *sapphiros*† but is paler and in color resembles the sea near the shore.

*Capnitis** (as some think) is a separate species of stone, covered with many wreaths of a smoky hue as I have already stated (See Chapter 37 *capnias*.*). It occurs in Cappadocia and Phrygia. Some sorts of it resemble ivory.

It is commonly said that *callainae** occur many joined together.

*Catochites**¹ occurs only in the island of Corsica. It is larger than most precious stones: a remarkable stone provided what is said of it is true, namely, that if one puts his hand on it, the hand is held fast as by a gluey gum.

*Catopyrites** is found in Cappadocia.

Cepitis or *cepocapites** is a white stone and its veins seem to meet together in knots: and so white and clear is it that it makes excellent mirrors.

*Ceramites** in color resembles an earthen pot.

Cinaedia is found in the brain of a fish called *cinaedus*: white and elongated and marvelous, if we can believe what is said of it, that whether clear or clouded it foretells calm seas or storms.

Cerites resembles wax.

Cercos resembles the plumage of a hawk.

*Corsoides** resembles a gray wig of hair.

*Coralloachates** resembles coral beset with points of gold.

Corallis resembles vermillion and comes from India and Syene.

*Crateris** has a color between that of *chrysolithos*† and *electrum*.* It is exceedingly hard.

*Crocallis** has the color of a cherry.

*Cyitis** comes from near Coptos and is white in color: it seems to be with child: for if it is shaken something rattles inside it.

*Calçophonos** is a black stone. If one strikes it, it

* Flint.

* Blue turquoise.
† Lapis lazuli.

* Smoke colored jasper?

* Brownish jasper.

* Turquoise matrix?

* Bitumen?

* Selenite??

* White agate??

* Siliceous kaolin??

* Asbestos??

* Red variety of agate?

* Yellow sapphire?
Zircon in part??

† Topaz.
* Amber.
* Garnet??

* Geode or
concretion??

* Basalt.

rings like a piece of bronze: the magicians state that those that play in tragedies should always wear it.

* Calculus of swallow.

There are two sorts of *chelidonia*.^{*2} Both in color resemble the swallow. One is purple and the other purple with a black spot here and there.

Chelonia, the eye of an Indian tortoise, has marvelous and wonderful properties according to those great liars, the magicians: for they promise and assure us that if one has well washed or rinsed his mouth with honey, then lays the *chelonia* on his tongue, he will gain the ability to prophesy and for a whole day he will be able to tell the future, but not if it be in the full or the change of the moon: and if it be in the waning of the moon, he shall have the gift only before sunrise: and while the moon is growing from sunrise to six hours later.

*Chelonitis*³ is so called because it resembles the tortoise. According to magicians this stone has great power to quiet tempests and storms: and especially they guarantee if that variety which has golden spots is cast into a pan of boiling water with a beetle, it will ward off an approaching storm.

* Calculus of wag-tail??

Chloritos^{*} is grass green in color, as its name indicates. Magicians say it is found in the gizzard of the bird called wagtail, where it forms.⁴ The magicians, as usual, order one to enclose it with a hoop of iron, after which it will do wonders.

* Partially oxidized copper ore??

Choaspitis^{*} is named after the river Choaspes. It is green, and lustrous like burnished gold.

* Peridot.

Chrysolampus^{*5} is found in Aethiopia. By day it is of pale color, but by night it glows like a coal.

* Pyrite?

Chrysopsis^{*} is so like gold that one might confuse the two.

* Obsidian?

The stones called *ceponides*^{*} grow about Atarna, in Aeolis, a little village now, but once a great town. They have many colors and are transparent. Sometimes they are like glass, again *crystallus*,^{*} and again *jaspis*.[†] These stones, even those which are not clear, being turgid or full of much extraneous matter, are nevertheless so lustrous on the surface that they reflect a man's or a woman's face as a mirror.

* Rock crystal.
Jasper.

Chapter LVII

DAPHNIAS, ETC.

Daphnias is a stone described by Zoroaster as being a cure for epilepsy.¹

*Diadochus** resembles *beryllus*.†

* Beryl??

† Beryl.

Diphyes is of two varieties, white and black, the male and female. The sex is distinctly determined by a certain vein in the stone.

Dionysias is a black and also hard stone, with red spots. If put in water it imparts to it the taste of wine and is said to permit drunkenness.

Draconitis or *dracontia**² is a stone which forms in the brains of dragons, but unless it be cut out while they live, or at least immediately after their heads are cut off, it does not form a precious stone: for, because of an inbred malice and hate that this creature has against man, if it languishes and approaches death, the dragon deprives the stone of its virtue. Therefore, the inhabitants approach these animals when they are asleep and cut off their heads. Sotacus (who wrote that he saw one of these stones in a king's hand) reports that those who seek this stone ride in a chariot drawn by two horses and when they see a dragon or a serpent, throw to it certain medicinal drugs to cause it to sleep, and in consequence they have the opportunity and the time to cut off its head. These stones are naturally white and transparent, they cannot be polished, and lapidaries can do nothing with them.

* Garnet?



Chapter LVIII

ENCARDIA, ETC.

Encardia,* a precious stone, is also called *cardiscae*.

* Fossil shell??

One variety is the shape of a heart: the second is green.

in color and it is also heart-shaped: the third shows the heart black, the rest of the stone being white.

*Enorchis** is a beautiful white stone. When broken, the fragments take the form of a male's genitals, hence the name.

As to *exhebenus*,* Zoroaster says that it is beautiful and white, and goldsmiths use it to burnish and polish gold.

Eristalis is a white stone but it seems to turn red if a man holds it in his hand obliquely.

Erotylos, also called *aemphicomos*, also *ieromnemon*, is greatly praised by Democritus for its ability to prophesy and to tell fortunes.

*Eumeces** comes from the Bactrian country and resembles flint. If laid under the head of a sleeping man it shows him by visions and dreams during the night all he wants to know, or does so at least as well as an oracle could.

Eumetres,* which the Assyrians call the gem of Belus, their most sacred god whom they honor with the greatest devotion, is green as a leek and is extensively employed in their superstitious invocations, sacrifices, and exorcisms.

*Eupetalos** has four colors, blue, red, vermillion, and apple green.

*Eureos** is shaped like the stone of an olive, is grooved like a winkle shell, and is not very white.

Eurotias seems to have a certain mouldiness, covering the black beneath it.

Eusebes seems to be the kind of stone of which, per report, the seat of Hercules in his temple at Tyre was made and there the gods appear and show themselves.

Any precious stone which is white but is overcast with black is called *epimelas*.

* Concretion or cast of fossil shell.

* Chalcedony?

* Chalcedony??

* Amazon stone.

* A banded agate??

* Fossil: Echinus or pentremite.



Chapter LIX

GALAXIAS, ETC.

The gem *galaxias*,* called by some *galactites*, is like those next to be mentioned, but is traversed by white or blood red veins.

Galactitis,*¹ on the other hand, is as white as milk, hence its name. Many call the same stone *leucas*, *leucographias*, and *synnephitis*. If bruised, it yields a liquid resembling, both in color and taste, milk. It is said to supply wet nurses with an abundant supply of milk: further that if it be hung about the necks of infants, it increases the flow of saliva. On the other hand, if held in the mouth it soon melts. It is said to impair memory and to cause forgetfulness. It is found in the rivers Nile and Achelous. Other authorities, however, call that *smaragdus** which seems to be surrounded by white veins, *galactites*.

*Galaicos** is much like *argyrodamus* but it is more befouled; usually two or three occur together.

*Gassidanes**² comes from Media. In color it resembles blades of wheat and appears to be beset here and there with flowers. It also occurs around Arbela. This stone is said to conceive, and by shaking it, it shows it has a child within its womb. It conceives every three months.

*Glossopetra**³ is shaped like a man's tongue. It does not form in the ground but instead during the eclipse of the moon it falls from heaven. It is valued by the magicians as a necessity to panderers and those who court fair women: but we do not need to believe this, considering the other impossible claims they made for it, for they also assure us that it silences the winds.

*Gorgonia** is merely coral. The special name is due to the fact that it grows to be as hard as stone: it quiets the waves of the sea and makes it calm. The magicians add it preserves one from lightning and terrible tornadoes.

They are equally wrong as to *gumane*, namely, that it guarantees revenge and punishment to one's enemies.

* Iron-stained chalk or limestone??

* Chalk or limestone?

* Emerald.

* A sulphide??

* A concretion??

* Fossil shark's tooth.

* Coral.

Chapter LX

HELIOTROPIMUM, ETC.

* Bloodstone.

The precious stone *heliotropium** is found in Aethiopia, Africa, and Cyprus. Its groundmass, leek green, is decorated with blood red veinlets. It is so named because if it is thrown into a pail of water it, by reflection, transforms the beams of the sun to blood red. Especially is this true of the Aethiopian stone. When removed from the water it reflects the sun as if in a mirror and if there is an eclipse of the sun one can readily see how the moon goes in front of the sun and obscures its light. Particularly impudent and unseemly are the magicians' statements regarding this stone for they say if a man carries it and the herb *heliotropium* and mumbles certain verses as charms, he becomes invisible.¹

* Pyrite? Rock crystal or garnet??

*Hephaestitis**² is in reality a looking glass, for although it is of a reddish or orange color, it reflects one's face. To prove that the stone is genuine, if put in scalding water, the latter is cooled: or if placed in the sun, it sets fire to dry wood or similar fuel. It is found on the hill Corycus.

Horminodes is so named on account of its green color resembling that of celery. Again it is white, and again black, and still other times pale. However, enclosing it like a hoop is a circle of gold.

* Iris? Opal??

*Hexecontalithos** is a small stone, and is so named on account of the number of its colors. It is found in the region of the Troglodytes.

* Jasper??

*Hieracitis** changes color as it is turned. It resembles the kites' feathers, especially the black.

* Oolitic limestone, silicified??

*Hammitis** resembles fish roe: and yet another variety appears to be composed of nitre: the stone for the rest is very hard.

* Ammonite.

The precious stone called *hammonis cornu**³ is considered the most sacred gem of Aethiopia. It is of the color of gold and has the form of a ram's horn. The magicians assert that this stone will cause dreams of future events to appear in the night.

The 37th Book of Pliny the Elder

Hormesion is held to be one of the loveliest of all gems for it has a fiery color which sends out beams of gold, but on its boundaries is always a white and pleasant light.

Hyaenia derives its name from the hyena's eye. The stone is found in the animal after it is hunted and killed: and if we believe the magicians, this stone if put under a man's tongue, will enable him to prophesy regarding the future.

Bloodstone or *haematitis** is⁴ chiefly found in Aethiopia and such is the best. Others come from Arabia and Africa. In color it is like blood, hence its name: and this stone I must not pass in silence, as I have promised to reprove the vanities and illusions of the impudent and barbarous magicians, deceivers of the world with their impostures: for Zachalias, the Babylonian, in books which he dedicated to King Mithridates, attributed to gems all the destinies and fortunes of the human race: and particularly as to this bloodstone, not content with having ascribed to it medicinal virtues as to diseases of the eye and liver, he advises those to wear it who desire favors of kings and great princes, for the stone will speed and further their suit. In addition, he adds, it assists to win law suits and, in war, victory over the enemy.

There is another stone of the same general family called by the Indians *henui** and by the Greeks *xanthos*. It has a whitish color on a ground of tawny yellow.

* Hematite? Blood red jasper??

* Yellow jasper?



Chapter LXI

IDAEI-DACTYLI, ETC.

The stones called *idaei-dactyli** are found¹ in Candia. They are of an iron color and in form resemble a man's thumb.

* *Icterias** has four varieties: to wit, one resembling

* Belemnite.

* Limonite in part

the drab colored bird *lariot*. It is hence considered good against jaundice: a second of a more livid color: the third resembles a green leaf, is wider than those already described, weighs little or nothing, and is traversed by many pale veins: the fourth is of the same color but has black veins crossing it.

* Meerscham?

*Jovis gemma** (Jupiter's gem) is² white, light, and fragile.

Indico takes its name from the nation whence it comes. Its color is somewhat reddish and if it be rubbed it gives off a certain purple liquid like sweat. There is another substance of the same name but it is white, and resembles dust or powder.

* Violet andalusite or apatite??

The Indians also have a gem called *ion** since it has the color of a March violet: but only rarely is it of bright and lively blue.



Chapter LXII

LEPIDOTIS, ETC.

* A mica aggregate??

The stone *lepidotis** resembles the scales of fish in various colors.

Lesbias is named from the island of Lesbos, its native place. It is also found in India.

* Eye agate?

*Leucophthalmos**¹ is reddish or tawny, and inset in a groundmass of that color is the form of an eye, either white or black.

St. Stephen's stone??

*Leucopetalos** resembles new snow, although it is garnished with a golden luster.

* Rock candy?

*Libanochrus** is of the² color of frankincense and yields a liquor like honey.

* Emerald?

*Limoniatis** seems to be the same as *smaragdus*.

* Marble with pyrite veinlets or gold quartz??

Regarding *liparis*, an unctuous stone, I can find only this written of it, that its odor or smell brings forth from their hiding places any poisonous vermin.

*Lysimachos** resembles the marble of Rhodes and

contains veins or streaks of gold. This stone, which is polished on marble, when all the roughness is removed is much reduced in size.

*Leucochrysos** appears to be a *chrysolithos*† with white veins or streaks in it.

* Inferior topaz.
† Topaz.



Chapter LXIII

MEMNONIA, ETC.

There is a gem called *memnonia* but none of the books describe it.

*Medea**¹ is a black stone first found by that famous Medea regarding whom the poets write so many fables. It is crossed by veins of a golden color and something like sweat issues from it, yellow as saffron and tasting like wine.

* Alum slate.

Meconitis is shaped like a poppy's head.

We obtain the stone *mixtrax** from Persia and from the mountains along the Red Sea. It occurs in many colors and in the sun it reflects various tints.

* Opal??

*Meroctes** is green like a leek and if it be rubbed a liquid like milk is given off from it.

* Alum??

Mormorion,*² an Indian stone, is almost black and transparent and is also called *pramnion*. The Alexandrian variety has intermingled with it the fiery red of the *carbunculus*:* the Cyprian *mormorion* has a trace of *sarda** in it. It is also found at Tyre and in Galatia. Xenocrates states it is also found among the Alps. Any design can be engraved on it, it being well suited to that art.

* Smoky quartz.

* Garnet, ruby, spinel and other red gems.
* Carnelian, in part sard.

Myrrhites has the color of myrrh and the habit of a fine precious stone. It yields the smell of a sweet perfume or ointment and, being scratched, also that of *nard*.

Myrmecias is black and on its surface has nodular warts.

*Myrismitis** is honey-colored and smells like myrtle. *Misoleucos* has bisecting it a white line. On the contrary, it is called *mesomelas* when a black line bisects any other color in its interior.

* Amber??



Chapter LXIV

NASAMONITIS, ETC.

*Nasamonitis** is the color of blood, although it is cut by certain black veins.

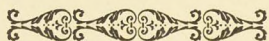
* Banded jasper??

*Nebritis** is a stone consecrated to Bacchus. It is so named from its resemblance to the deerskins that he was accustomed to wear. There is another variety which is black.

* Banded jasper??

The gem *nympharena** is named from a Persian city. It resembles the teeth of a hippopotamus.

* Fossil tooth.



Chapter LXV

ORCA, ETC.

Orca is the barbarian's name for a certain precious stone which is very beautiful. In it black, yellow, green, and white occur together.

*Ombria**, which some call *notia*, is said to fall from the heavens in storms and rain showers and with lightning in the same manner as do the stones called *cer-
aunia** and *brontea*. It has the same magical properties as those attributed by report to *brontea*, and further, as long as it lies on the altar hearth the offerings placed there will not burn.

(Other texts insert here "*Onocardia* is like kermes-
berry, but it is not otherwise described.")

*Oritis** is round like a globe. Some call it *siderites* and fire does not attack it.

*Ostracias** or *ostraoitis* is shaped like a shell and is

* Meteorite or pre-
historic stone axes.

* Inferior moonstone?
or satinspar??

* Mammillary magne-
tite?

* Flint?

exceedingly hard. A second kind resembles the *achates** but, after polishing, the *achates* looks smooth while the *ostracias* does not. The harder kind of this stone is so hard that its fragments are used to engrave gems.

As for *ostritis*, it takes the name of an oyster shell, which shape it has.

The barbarians have a precious stone which they call *ophicardelos*. It is black with two white lines or circles on the outside.

As to the stone *obsidianus*,* I have written enough in the book which precedes this one* and yet there are certain gems of that name and of the same color not only from Aethiopia and India but also from Samnium, as some state, and even from the coasts of the Spanish Ocean.



Chapter LXVI

PANCHRUS, ETC.

Panchrus,* judging from the name, is a stone of all colors.

*Pangonius** is not longer than one's finger. It is distinguished from *crystallus** because it has more angles, hence its name.

Metrodorus does not write what kind of a stone *paneros* is.¹ He, however, repeats a fine verse of Queen Timaricis and from it, together with the fact that the stone is dedicated to Venus, it is to be understood that by it she became pregnant and bore children. Some call this gem *pansebaston*.

Of the gem *pontus*, also known as *pontica*,* there are many subspecies. One is full of stars together with blood red or black specks in the manner of drops and it is among the stones tied to religious ceremonies. Another has no stars but only streaks and veins of the same color. Still another shows mountains and valleys.

The gem *phloginos*,* also called *chrystes*, is found

* Agate.

* Obsidian.

* Book XXXVI. See appendix.

* Hindu *panchratna*??

* Colorless topaz??

* Rock crystal.

* Agate??

* Red ochre?

in Egypt and is said to resemble the *ostracias* of Attica. *Phoenicitis** took its name from its resemblance to a date.

Phycitis is so named because it looks like seaweed which in Greek is called *phycos*.

Perileucos is a stone which is so called from a whitish lace or color which appears to go from the top to the bottom of the stone.

The gem *paeantitis**, called by some *gemonides*, is said to conceive and to bring forth little stones. In consequence, it has great virtue in helping women in travail. It is found in Macedonia near the monument or sepulchre of Tiresias and the stones brought forth are like water congealed into ice.

* Pentremite.

* Rock crystal??



Chapter LXVII

SOLIS GEMMA, ETC.

* Moonstone??

*Solis gemma** (the gem of the Sun) is white and like the sun, it casts forth on every side shining rays.

* Barnacles.

*Sagda** is a stone which the Chaldeans find sticking to ships and they say it is of a green color like that of leeks.

* Lignite or jet?

Samothrace, the island, furnishes us with a precious stone* black in color, light in weight, and resembling rotten wood.

* Sard??

*Sauritis**, it is said, is found in the belly of a green lizard, provided the latter is slit open with the sharp edge of a cane or reed.

* Selenite?

*Selenitis** is a¹ precious stone, white and transparent, giving forth a yellow luster like honey, and having in its interior the representation of the moon, either the full moon or the moon as it begins to change. This fine stone is said to be found in Arabia.

* Magnetite?

*Siderites** is very similar to iron and it is supposed that if it be brought among those in a legal dispute, dis-

cord and dissension among the litigants will continue. Of this *siderites* a variety is called *sideropocilos** because of its numerous spots. It is found in Aethiopia.

*Spongitis** resembles a sponge, and hence its name.

Synodontitis is found in the brain of the fish called *synodontes*.

The stone *syrtitis** is found on the coast of the Syrtes, by a tribe of Barbary, also in Lucania. It shines with a color the combination of saffron and honey and within it are certain stars which, however, are dim and dark.

The stone *syringitis** is hollow like a tube and resembles a straw between two joints.

* Magnetite??

* Pumice??

* Bronzite??

* Fulgurite??



Chapter LXVIII

TRICHRUS, ETC.

Trichrus, a stone which comes from Africa, is black but if rubbed it yields three kinds of liquid: from the lower end black: from the middle blood red, and at the top white.

*Telirrhizos** is of ash or reddish color but the lower end is a lovely and slightly white.

Telocardios is highly esteemed in Persia where it is found. In color it resembles the heart and in the Persian language is called *mulc*.

*Thracia** has three varieties; green, pale green, and a third filled with bloodlike spots.

Tephritis, although of the color of ashes, is shaped like the moon in its increase, tipped with horns.

*Tecolithos** resembles the stone of an olive. It does not belong with the precious stones but he who licks it will find his gallstone broken and voided.

* Inferior amethyst.

* Jasper??

* Pentremite.



Chapter LXIX

VENERIS CRINES, ETC.

* Rutile hair in quartz??

* Gray tufa?

The stone *veneris crines** (Venus' hair) is jet black and shining, although therein are a group of red hair-like objects.

*Veientana** is a gem characteristic of Italy and found near Veii, a Tuscan city. It is black and is cut in the middle by a white band.



Chapter LXX

ZANTHENE, ETC.

* Amber.

* Greenish alabaster??

Zanthene, as Democritus writes, is usually found in Media. In color it resembles *electrum** and if one places it in date wine and saffron mixed, it softens like wax and gives off a most sweet and pleasant odor.

*Zmilaces** is a stone found in the river Euphrates. It resembles the marble of Proconnesus, but within it has a greenish color.

Last and finally, *zoromisios* occurs in the river Indus. It is known as the magician's gem but the books say nothing further about it.



Chapter LXXI

PRECIOUS STONES WHICH TAKE THEIR NAMES
FROM PARTS OF THE HUMAN BODY

* Hematite??
† Steatite?

In addition to the gems listed alphabetically above, there are other precious stones known from other characteristics and these are divided into important varieties. Some bear the names of members of the human body as, for example, *hepatitis** from the liver and *steatitis*† from the different varieties of fat grease or tallow of

various beasts. *Nephros** is a stone worshipped among the Egyptians, as is also *thendactylus*. As to Adad, he is the chief god among the Assyrians. The stone *triophthalmos*,* in addition to consisting of onyx, has eyes like those of man, except that three of them are in the stone close to one another.

* Jade??

* Eye agate.



Chapter LXXII

PRECIOUS STONES NAMED FROM ANIMALS

Other stones are named after beasts. For example, *carcinias*, because it is the color of the sea crab; *echitis* from that of a viper; *scorpitis* either because it is of the form or of the color of a scorpion; *scaritis* from the fish *scaurus*; *triglitis* from the mullet; *aegophthalmos** from a goat's eye. Similarly we have *hyophthalmos** because it is like a pig's eye. *Geranitis* took its name from a crane's color, as did *hieracitis* from the color of a hawk or falcon. *Aetites** has the color of the species of eagle which has a white tail; *Myrmerites** shows an ant creeping within the stone, while *cantharias** encloses beetles. *Lycophthalmos** resembles¹ a wolf's eye and has four circular colors, outside tawny, inclining on its edges to a blood red, in the very middle black, and enclosing in it a white circle closely resembling a wolf's eye. The stone *taos* is like a peacock, as the gem *chelonias* resembles a tortoise. (Some texts refer here to "*timictonia* of the color of an asp.")

* Eye agate??

* Eye agate??

* A concretion.

* Amber with ant

entrapped.

* Amber with beetle

entrapped.

* Concentric agate

geode??



Chapter LXXIII

PRECIOUS STONES NAMED FROM OBJECTS

*Hammochrysos** looks as if sand and gold were intermixed. *Cenchritis* seems to be made of grains of millet scattered here and there. *Dryitis** resembles a tree

* Scales of iron-stained
mica schist.

* Lignite.

- * Moss agate?
- * An artificial compound?
- * Concretion??
- * Pentremite?

* Rock crystal or diamond?

* Diamond.

* Onyx??

* Enhydros.

* Rutilated quartz??

* Brownish yellow jasper.

† Spotted jasper.

* Topaz.

* Chrysoprase.

Copper sulphate??

Black jasper with red and white veins??

* *Lusus naturae*.

trunk, and the same burns like wood. *Cissitis** is shining white, in which there seem to be ivy leaves. *Narcissitis** is also distinguished and divided by strings of ivy. *Cyamea** is black but, broken, it yields a bean-like nut. *Pyren** is so called from its resemblance to an olive stone. Within the same stone, fish bones sometimes occur. *Chalazias**¹ is named from its resemblance to hail in both form and color, but it is as hard as the *adamas*.* It is also stated that if it be put in the fire, it remains cold and is not in the least changed. The fire stone, *pyritis*, is black, but rub it in your fingers and it burns. *Polyzonos** is a black stone; many white fillets, however, encircle it. *Astrapias* is white or blue, like *caeruleum*, yet from its midst rays of lightning seem to shoot. In the stone *phelgontis* is a burning flame which never reaches its surface. In the *carbunculus* (Chapter 27, *anthracitis*) sparks fly to and fro. *Enhygros** is² marvelously smooth and white and contains within it a certain liquid which moves to and fro as one shakes it, just as does the yolk of an egg. *Polytrix** is a green stone, ornamented with fine veins, as is the head with hair, and according to report it will cause the hair of the one who carries it to drop off. *Leontios** bears the name of a lion's skin; *pardalios*† that of a panther. The golden color gave the gem the name *chrysolithos*;* similarly, the grass green color of the leek gave the name *chrysoprasius*.* *Melichrus* was named from honey, although this stone has many varieties. *Melichloros* is of two colors, yellow and honey colored. *Crocias* is yellow as saffron, and *polia* is gray like the hair of an old man. *Spartopolias*, a black gem, shows gray veins like the last, but is much harder. *Rhoditis* took the name of the rose, *melites* of the apple for it is of that color; *chalcitis** of bronze and *sycites* of the fig. I see no connection between the stone *barsycite** and its name. This stone is black and is covered by a branch with white or blood red leaves. Nor can I see any etymological relation in *gemites*,* which has white clasped hands, as if engraved in the stone. As for *anachitis*, it is used in hydromancy to summon the spirits. Similarly, in the same art *synochitis* holds the

spirits, so called, above ground. As to white *dentritis*,^{*3} if it is burned under a tree that is to be cut down, the axhead to be used will not be turned or become blunt. There are a number of other stones and the tales regarding them are even more exaggerated than those already told. For these, the barbarians have devised strange names, pretending to tell us they are actually stones. For me, it is sufficient that I have disproved their lies regarding the stones mentioned above.

* Moss agate? Tree marble or prehistoric axes??



Chapter LXXIV

NEWLY DISCOVERED STONES:
COUNTERFEIT AND ARTIFICIAL STONES

There still exist precious stones which have not as yet been found: and others so recently found that they have no name such as that found in the gold mines in Lampsacus, so lovely and beautiful that it was considered a present worthy of being sent to King Alexander the Great, as Theophrastus writes.

The stone *cochlides*,^{*} which¹ is now frequently seen, appears rather to be an artificial than a natural product and, in reality, it is stated that in Arabia they occur as huge masses which are soaked in honey seven days and nights in succession. By this means all the earthy and other refuse is removed, the stone alone, pure and clean, remaining. At this point the lapidaries begin their work. The *cochlides* is then adorned with different veins and reduced into such drawn work or inlaid marquetry as the purchaser wishes. And in this the cutter is cunning for he knows what can be sold and, to the merchant, one man's money is as good as that of the next person. In ancient times, they were made so large that the kings of the East had their horses decorated with them, not only on their foreheads but also as pendants to their trappings.

* Shell ornaments.

And it is true that all precious stones, steeped in honey, look fair and clean with a pleasant luster but, above all, those steeped in Corsican honey. These same stones, however, are not favorably effected by other liquids, even if the latter are more powerful than honey.

Our lapidaries, further, have a term for those stones to which new colors are imparted, namely *physis*, as if there were not other names for them and, due to their cunning wit, they give them this strange and artistic name: as if of all nature's products they were the most esteemed. Indeed, there be an infinity of names for precious stones all devised by the shrewd Greeks, who incidently always prattle on (regarding this I will make no comment). But having already described the noble and rich gems, and having just previously condescended to name those of a baser sort; of these I have described only the rarer sort and have picked out and mentioned only the most worthy. But first this should be well understood, that one and the same stone changes its name according to the various spots, marks, and warts that characterize it: according to the many lines that cross them, the various veins in them, and the different colors of the veins.



Chapter LXXV

FORMS OF CUT STONES

We must now list some general observations governing all kinds of gems, and these following the most approved and most experienced authors on the subject. Any cut stone exhibiting hollows or depressions or the reverse imperfections on the top are not nearly as good as those that have a smooth level table. Oblong forms are most esteemed, next those shaped like the seed of a lentil; next those that are round like a target shield.

Those which are cut with many faces and angles are admired the least of all.

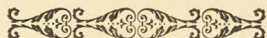
To distinguish between a fine genuine stone and a false counterfeit stone¹ is very difficult, particularly as true gems are made into another kind of a counterfeit. For instance, men make *sardonychi** by² setting and glueing together gems called *ceraunia** and this so artfully that man's hand cannot be seen in the hoax: so handsomely are they banded, the black layer taken from this stone, the white from that, and the vermillion from another stone according as required to produce a handsome stone, and all this in the most approved manner. Moreover, I have in my library certain books by authors now living, whom I would under no circumstances name, wherein there are descriptions as to how to give the color of *smaragdus** to *crystallus*† and how to imitate other transparent gems: for example, how to make a *sardonychus** from a *sarda*:† in a word to transform one stone into another. To tell the truth, there is no fraud or deceit in the world which yields greater gain and profit than that of counterfeiting gems.

* Sardonyx.

* Inferior moonstone?
or satinspar??

* Emerald.
† Rock crystal.

* Sardonyx.
† Carnelian, in part
sard.



Chapter LXXVI

HOW TO TEST PRECIOUS STONES

Let others write of how to deceive the world by counterfeiting gems: I prefer to take the contrary course and show how to expose false stones that counterfeit gems: for although men and women be both reckless and prodigal in their excessive wearing of jewels, yet they should first be forewarned and then again be warned against such deceivers. And, although while treating of the principal and more important gems I have said something on the subject, I will expand this somewhat. The first requisite is that all transparent stones should be tested in the morning and at the latest

(if an earlier hour cannot be chosen) within four hours after morning light, but never later. Now there are numerous tests which prove whether a stone is real: for example, the weight of the stone, for ordinarily the fine gem is heavier than the false: next, the real gem is cooler than the imitation. Thirdly, the body and substance must be considered for it is common to see in the center and bottom of imitation stones certain little lumps rising above the surface; the surface of false gems is usually rough; the filaments in false gems are without definite luster and, instead of reaching the eye, the luster becomes weak and vanishes. But the best proof of all is to take a small fragment and to grind it on an iron plate for hardness: but jewelers will not permit such a test nor will they permit testing with the file. Likewise, fragments of *obsidianus** will not scratch or indent true gems. Further, false stones if they be engraved or pierced, show no white powder. There is a great difference as to the ease with which stones are engraved. Some cannot be engraved at all with an iron point, others can only be cut with the tool bent and turned back (i.e., a blunt edge developed) but every precious stone may be engraved with the *adamas*.* And in reality, the most important thing is to heat the engraving steel or point.

As to rivers that produce precious stones, the Acesieus¹ and the Ganges are the most important and India, as a land, is the chief source.



Chapter LXXVII

COMPARATIVE ADVANTAGES OF DIFFERENT COUNTRIES

And now, having described adequately all the works of nature, I would conclude with the general difference between the things themselves, and more particularly between the various countries. In conclusion, if you

go through the whole world, and all the lands lying under heaven, Italy will be found to be the most beautiful and goodly region under the sun: surpassing all others and in every respect to be considered the principal and most important. Italy, I say, is the very dame and queen, yes a mother second only to Mother Earth. Renowned for brave men, for fair and beautiful women, enriched with military leaders, soldiers, and slaves; situated in a climate wholesome and temperate; located commercially (having a coast with many fine harbors) for traffic with all nations, in which the winds are favorable (for it lies in the best quarter of the earth, equally distant from the East and the West) having at its command rivers, large and fine forests, and most healthful air; bounded by high ranges of mountains, stored with wild but harmless beasts; and finally as to its soil, no other country compares with it, it is so fertile to grow grains and so suitable for pasturage. In resumé, whatever is necessary and required for the maintenance of a civilized life is found there and in no place more abundantly; all kinds of grain, wine, oil, wool, linen, mutton, and excellent beef thrive there: as for horses I have always heard, even from those who are race track followers, that Italian horses are to be preferred to all others; as for mines of gold, silver, copper, and iron, it was surpassed by no country, so long as the government permitted mines to be worked. In addition to those rich commodities which Italy still has within her womb, she yields us a variety of good liquors, an abundance of all sorts of cereals and of fine fruits of all kinds. But if I must mention a land after Italy (leaving out of consideration the unbelievably fabulous reports regarding India) in my opinion Spain is second in all respects although, of course, I refer to those parts which border the sea.



The Bamberg text adds that Gaul approaches Spain in excellence. Then goes on:

A ROMAN BOOK ON PRECIOUS STONES

* Rock crystal.

* Diamond.

† Emerald.

* Agate and other species of cryptocrystalline quartz and fluorspar.

* Jet.

"As to the value of products, the most valuable product of the sea is the pearl: of the products that occur superficially on the earth's surface, *crystallus** is the highest priced: and among the products of its interior the highest value is placed on *adamas**, *smaragdus*,† precious stone, and *murrha*.* Gold, so sought after by all men, hardly holds the tenth place in rank of precious things, and silver hardly the twentieth.

"Hail to thee Mother Nature: please show your favor to all Roman citizens. I alone have described you from every viewpoint and have thus caused you to be praised."



Appendix

BOOK XXXVI

GAGATES

Chapter XXXIV

*Gagates** is named¹ after Gages, a town and river in Lycia. It is said also that the sea casts it up at high water for a distance of twelve *stadia* on the island Leucola. It is black, homogeneous, and smooth, of a light and porous substance like pumice and resembling in its nature, wood. As to weight, it is light and it is also brittle: and if it be rubbed and bruised it gives off a strong odor:² letters written with it on earthenware cannot be removed. If burned, it smells like sulphur. Regarding it, there is this wonderful thing: that water makes it burst into flames and oil thrown on it will quench the flames.³ When it burns, its odor chases away serpents⁴ and brings women in childbirth out of their trances. The same color discovers epilepsy and indicates whether a young woman is or is not a virgin.⁵ When *gagates* is boiled in wine it cures the toothache:⁶ and intermixed with wax it cures scrofula. It is reported that the magicians use *gagates* in those

ceremonies which they practice with the use of red hot axes (called *axinomancy*) for they claim that if the stone be placed on the axes it will burn and be consumed and that by this action what we desire and wish, shall happen accordingly.



Chapter LXVII

OBSIDIANUS

To be considered as one of the¹ glasses² is the stone which is called *obsidianus*,* since it resembles those stones which one Obsidius found in Aethiopia.³ The stone is black in color, although transparent: but dull and dusky to the sight. It serves as a mirror in a wall, but instead of the image it yields back the shadow. Of it many have made jewels⁴ in place of using precious stones: and I myself have seen statues carved from it of a very considerable size⁵ of Augustus, the late and revered emperor. Indeed, he dedicated in the temple of Concord, for a strange and miraculous reason, four elephants made of *obsidianus*. Tiberius Caesar sent back to the citizens of Heliopolis an image of Prince Menelaus, found among the household gods of one who had been lord governor of Egypt. Tiberius had stolen it from among the treasures of a temple: and this statue was of *obsidianus*. From this it is evident that this stone was in use long ago, and is now again in use. It is excellently counterfeited by glass.

* Obsidian.

Xenocrates writes that it is found among the Indians, in Samnium in Italy, and in Spain⁶ along its ocean coast. Further, there is a kind of obsidian glass, artificial to be sure, but black as jet. It is used for dishes and platters from which meat is served. .

Section III



Notes



CHAPTER I

1. Due to the beauty, rarity, and value of gemstones, Greeks and Romans of classical time studied them more assiduously than they did the commoner minerals. In consequence, Pliny has transmitted to us more details regarding gems than he has regarding any other group of minerals.

2. C. W. King* thinks the word *gemma* originally meant a "bud," because the engraved gem projected from the ring as did a bud from the bark. I wonder if it is not an earlier expression of the thought which lead Abbe Haüy to call precious stones "the flowers of the mineral kingdom" and the Uralian lapidary to name his material *tzventnie kameni* (flower stone). So valuable did the Romans consider the emerald, ruby, and sapphire that they rarely engraved them.

* *Natural His. of*
P.S., London, 1867,
p. 4.

3. Prometheus, chief cultural hero of Greek mythical legend, taught man the use of fire, against the wishes of Zeus. Zeus, as a punishment, chained him to a rock and sent an eagle each day to devour his liver; during the night the liver grew again; hence Prometheus' torture was continuous. Hercules shot down the eagle and broke the captive's chains.



CHAPTER II

1. It was his ally Amasis, king of Egypt, who suggested that Polycrates' continual good fortune might be distasteful to the gods and that, in consequence, he should part with something he highly esteemed. When Amasis learned that the ring was again in Polycrates' possession, he renounced his alliance with him, believing him doomed by the gods. Perhaps he was right for

Oroetes, satrap of Sardes, having Polycrates in his power, crucified him in 522 B.C.

2. The theme of the lost ring and its return via a fish's stomach is an ancient one, related frequently with slight variations. It, like many other tales, appeared first in Europe, as the Polycrates version precedes the earliest known Hindu version by some centuries. An even earlier Greek variant, perhaps the source of the fish-ring myth, is the Greek myth that Minos, king of Crete, threw a ring into the sea and then demanded that Theseus bring it back to prove that, as he claimed, Neptune was his father. Being born to the sea maidens by dolphins, the latter immediately gave him the ring and he returned it to Minos. As, however, the fish-ring tale is not preposterous, for fish are attracted by any bright object and not alone by shining tackle, it may have originated independently in Rome and India. The earliest Hindu form is by the great dramatist, Kalidasa (3rd to 6th century A.D.), it being the theme of his masterpiece *Sakoontalá*. *Sakoontalá* was cursed by a sage who said she would be forgotten by the man she loved and that the curse would only be removed when her lover saw the ring he had given her. She lost the ring, the present of her husband, the king, and his jealousy was aroused. The ring was recovered from the belly of a fish and the monarch, recognizing it, forgave her and they lived happily ever after, we are informed. There are many variants of the story, some earlier and many later. Pseudo-Callisthenes, an Alexandrian of the 2nd century of our era, states that Alexander the Great once speared a fish and in its belly found a luminous white stone which he thereafter used as a lamp. One of the most amusing variants is that of the Great Mogul, Akbar-Shah, his minister, Beer-bul, and Akbar's priceless ruby set in a ring.* Akbar had given his minister the ring for safekeeping. A thief stole it and it later fell into Akbar's hands. Throwing it into a river, Akbar then innocently asked Beer-bul for the return of the ring within a few hours or else!! The miserable minister by a lucky chance regained the ring via a fish's stomach. In consequence, he not only

* Bayard Taylor, *A Visit to India, China, and Japan*, New York., 1855, pp.126-9.

Notes

saved his life but regained his former position at court.

Among the Talmudic's tales is that of Solomon's ring, on the possession of which his kingdom depended. A devil, Sakhar by name, by craft got possession of it, supplanted Solomon as king, and then threw the ring into the sea. It was swallowed by a fish in whose belly Solomon found it. He thus regained his throne and for all time disposed of Sakhar.*

St. Augustine* (354-430 A.D.) tells of Florentius, a poor Christian, who got a much needed cloak by selling a gold ring found in a fish.

Arnulphus, Bishop of Metz and grandfather of Charlemagne, according to Pietro Damiani (11th century A.D.), having thrown his ring into the Mosella (Moselle River), received it back via a fish's stomach, a sure sign of the remission of his sins.* The ceremony of the wedding of the Adriatic by the Doge of Venice is a classic. Once the ring thrown into the Adriatic by the Doge, according to Italian legend, was found in a fish, a sure sign of the fall of the Venetian republic. The fish-ring theme appears in the folk tales of Kashmir and in the Samoan folk tale of Siati.

In the armorial bearings of Glasgow is a salmon with a ring in his mouth. Saint Kentigern (Bishop of Glasgow) through prayer is supposed to have restored the lost wedding ring of the wife of a governor of the town, the churchman having recovered it by finding it caught in the gills of a salmon. Thereupon the estranged husband forgave the wife whom he had thought faithless and she became a Christian.

In the cemetery of St. Dunstan's parish church, Stepney, London, is a monument to Dame Rebecca Berry, long supposed to be the heroine of that most amusing ballad *The Cruel Knight and the Fortunate Farmer's Daughter*. Warned that a babe was destined to be his wife, the knight in this tale attempted to bring about its death. When the babe grew to young womanhood, he took her to the sea, intending to drown her. Relenting, he cast a ring in the sea, telling her never to see him unless she had the ring. The woman became a cook, found the ring in a cod and married the knight.*

* C. F. and L. Grant, *African Shores of the Mediterranean*, New York, 1912, p. 479.

* *De Civitate Dei* XXII, 8.

* C. W. King, *Handbook of Engraved Gems*.

* Wm. Jones, *Finger-Ring Lore*, London, 1877, p. 99.

A ROMAN BOOK ON PRECIOUS STONES

* *Worthies*, p. 370.

Fuller* tells a similar ring-fish story regarding a merchant of Newcastle-upon-Tyne.

The Provencal form of the story—that of Pierre de Provence and the Princess Maguelone, dating presumably from the Middle Ages—combines two variants of ring mythology, the theft of the ring by ravens and its return via the route of a fish's stomach.

Scarcely a year passes without the metropolitan press giving space to a more or less creditable modern example of the tale.

* Book III, Ch. 41.
† Book VIII, Ch. 14,
line 8.

3. Herodotus,* Pausanias,† Dionysius of Halicarnassus, Suidas, and Clement of Alexandria say that the stone was an emerald rather than a sardonyx. Pausanias says: "Theodorus also made the emerald signet which Polycrates the tyrant of Samos constantly wore, being exceedingly proud of it." Both the emerald and the sardonyx were available to the trade of the time (i.e. about 522 B.C.). The *London Journal** claimed Polycrates' ring had been found at Albanu near Rome about 165 years ago and gives a description of the intaglio. The gem was supposed to have been engraved by Theodorus, the Samian, son of Telecles. Pliny's fellow citizens, in believing that the sardonyx in the temple of Concord was the original ring, were probably mistaken. It may be added that Herodotus says that the stone was a seal. Pliny, however, states* that it was not engraved.

* Vol. XXIII, No. 592.

* Ch. 4.

4. Pliny from the esteem in which he rightly held the ring, although probably wrong in believing it belonged to Polycrates, recognized the historical factor as an element in valuing gems. The tale also emphasizes the indestructibility of gems because Polycrates antedated Pliny by 600 years. Precious stones are everlasting; the gem once in the ring of a Roman knight may be worn on Broadway today. Juvenal (55-138 A.D.) perhaps recognized the indestructibility of precious stones even more than Pliny:

"Till now the finger bore

The gem which graced the scabbard long before:

Now rings are in disuse, and beryls shine,

And rubies lend their ruddy light to wine."

Satire V. Lines 75-6.

Notes

One of the interesting effects brought about by the partial disruption of trade through normal commercial channels due to World War II was the large resale in America of old and outmoded jewelry. Practically every department store opened a shop in which Victorian, and other even less attractive jewelry, was sold.



CHAPTER III

1. While in the instance of the gem of Pyrrhus (318-272 B.C.) art may have added its bit to a *lusus naturae*, agates and other stones in rare instances depict scenes or portraits readily recognized, particularly by those with some imagination.

Claudian* sings of a sardonyx:

*"The colored veins that o'er my surface play
An eagle's form with dusky wings portray,
With native hues traced on the flowered stone
A life-like figure to perfection shown."*

* Ep. XLIV.

In the South Kensington Museum, London, is an Egyptian jasper displaying naturally a very good likeness of the poet Chaucer.* In the Hope collection was an agate with a miniature face so perfectly portrayed that it seemed almost impossible it could be natural.*

Formerly, overly zealous Christians saw the head of Christ in numerous agates, a particularly famous one having been in the Imperial Museum at Vienna. Among the treasures of Strawberry Hill, England, the home of Horatio Walpole and of his father before him, was a jasper with an excellent likeness of Voltaire in nightgown and cap, and an equally good one of a woman. C. W. King* states that there is in the Florentine Galleria an agate accurately depicting Cupid running. In 1799 there was discovered in Russia a piece of labradorite with a profile of Louis XVI. The owner, Count de Robassome, valued it at \$50,000. Some six or seven years ago there was for sale in New York an

* Edwin W. Streeter, *Precious Stones and Gems*, London, 1887, p. 265.

* B. Hertz, *Catalog of the Collection . . . Hope*, London, 1839, p. 106.

* *Handbook of Engraved Gems*, London, 1885, p. 142.

A ROMAN BOOK ON PRECIOUS STONES

Australian black opal depicting Mount Fuji with a charming Japanese village and bridge in the foreground.

2. According to the Greek legend, Amymone was the daughter of Danaus. Nauplius, the wrecker, was the son of Amymone and the god Poseidon. She, and particularly her meeting with Poseidon at the spring, was frequently depicted on ancient coins and engraved gems.

3. Pliny's rebuke as to the vulgar display of jewels by mountebanks—and others—holds good today.



CHAPTER IV

1. Gem engravers were called *dactylioglyphs*, from two Greek words meaning "to engrave finger rings." One of the earlier known gem engravers was Bezaleel,* clever "in cutting of stones, to set them." Parts of Exodus date from the 6th century B. C., but its final revision may have been as late as the 5th century. The first Greek gem engraver known as a personality was Mnesarchus, the father of Pythagoras, who was engraving gems at Samos before 570 B.C. Aristotle says he was born at Turrhene. Appuleius* (2nd century A.D.) states that he "obtained reputation rather than wealth by very cleverly engraving gems." Theodorus the Samian (See note in Chapter II) must have been approximately his contemporary.

Plato* (428-347 B.C.) says that "in Aethiopia (our Egypt) they make use of engraved gems of which a man in Laconia would not have the power to make any use."

2. It was perhaps this signet by Pyrgoteles with the bust of Alexander the Great on it that, when prostrated with fever (23 B.C.), Augustus handed to Marcus Vipsanius Agrippa, as a sign that the latter should succeed him.*

* Exodus 31:2, 5.

* *The Florida*, London, 1902, p. 388.

* *Eryxias or On Wealth*, Bohn edition, Vol. VI. p. 72.

* *The Hist. of Dio Cassius* abridged by Xiphilin, translated by Francis Manning, London, 1704, p. 127.

Notes

A student of infusoria may be a greater zoologist than his confrere who devotes his life study to an elephant. The contemporaries Pyrgoteles, the gem engraver, and Phidias, the sculptor, were equally outstanding in their respective fields. In passing, it may be stated that Pyrgoteles and the gem engraver of today used similar tools.

The Greek glyptic art was at its peak in the time of Alexander the Great. We have a number of fine gem portraits of Alexander, but inasmuch as Pyrgoteles signed none of his masterpieces, we cannot say that any one of them is his work. On the other hand, gem engravers in the 18th century fraudulently engraved the name of the master in Greek characters on many gems, both classical and modern, to enhance their value. Any "signed" work of his is to be viewed with the greatest suspicion. For another to engrave on a gem the features of the divine Alexander was a sacrilege and, indeed, a crime. Appuleius* states that if anyone were found cutting "the most sacred image of his Sovereign, the same punishment would be inflicted upon him as was appointed for sacrilege." Pliny adds that only Pyrgoteles could engrave the emerald, but today lapidaries, Hindus in particular, frequently engrave flawed emeralds. During the reign of Claudius (41-54 A.D.), no one was permitted to wear a ring bearing the likeness of the emperor. Vespasian (69-79 A.D.) however, rescinded the order. In another passage* Pliny seems to say Pyrgoteles was alone permitted to make a marble statue of Alexander, so that he may also have been a sculptor. It is amusing to note that a German gem engraver of some ability, Lucas Killian, permitted himself somewhat pompously to be known as the "German Pyrgoteles."

3. We have no signed work of Apollonides, a Greek gem engraver who, Pliny states, postdates Pyrgoteles. He can scarcely be Apollonius, presumably an artist of a later time. Of the latter we have a signed work, a magnificent amethyst intaglio, the Diana of the Hills, now or recently in Naples.

4. Cronius, a Greek, also postdated Pyrgoteles and

* *Flor.*, p. 118.

* Book VII, Ch. 38.

lived before the Emperor Augustus. We have no engraved gem signed by him.

5. Dioscurides was the foremost gem engraver of the Augustan Age, a cutter of both cameos and intaglios. Augustus had successively in his lifetime three signets, a sphinx, a portrait of Alexander the Great, and then his own. The last is said to have been an excellent likeness of the emperor which, according to Pliny, later Roman emperors used as a seal. Dio Cassius* said all later emperors used it except Galba. Upon the death of Augustus, the seal was given to Maecenas. Dioscurides was a classicist, borrowing his themes from the best art and architecture of his predecessors. He originated little. A Greek, he appears to have come to Rome from Aegae in Cilicia, Asia Minor. He had three sons, Eutyches, Herophilos, and Hyallus, each of whom was a master gem engraver.

The gem portraits of Augustus which are supposed to be signed by Dioscurides are evident forgeries, but we have a number of other engraved gems signed by him which are authentic. Carnelian and amethyst were his principal materials.

6. Maecenas was a great lover of gems and Emperor Augustus in a letter to him* twits Maecenas on this subject. But Maecenas was eminently human and his precious stones did not compensate him for Horace's death. When away from Rome, Augustus left a duplicate signet in Maecenas' care, so that he could act as the Emperor's representative.* He and his associate Agrippa had this power from the battle of Actium until Augustus returned to Rome in 29 B.C. Similarly, when Vespasian (emperor 69-79 A.D.) was in Egypt, Mucian in Rome gave orders in the emperor's name, he having the latter's signet.*

7. The Emperor Augustus loved Maecenas and found him a most valued public servant and an assistant of the highest order. He, however, had a highly developed sense of humor and was not only amused at Maecenas' love of gems and other luxuries, but also by Maecenas' "fine writing." If we can believe Macrobius* (first half of the 5th century A.D.), the emperor

* cli. 91, 3, 51.

* *Macrob.* II, 4.

* *Horace*, Book II,
Satire VI, line 38.

* *The Hist. of Dio
Cassius*, etc., Vol. II,
p. 110.

* *Saturnalia*, Book II,
Ch. 4.

Notes

addressed him in fun as follows: "Adieu, most charming of humans; adieu, my little heart," and then described him as "a diamond of Samnium, pearl of the Tiber, emerald of the Alniens, beryl of Porsenna," etc. Perhaps there was a further hidden dig in the letter, for in Rome and in Spanish Islam slaves were frequently named after precious stones.*

* Reinhart Doyz, *Spanish Islam*, translated by Francis Griffin Stokes.



CHAPTER V

1. *Dactyliotheca* is from two Greek words, meaning respectively "case" or "cabinet" and "ring."

2. Marcus Aemilius Scaurus, who lived in the first half of the 1st century before Christ, was the stepson of Sulla. He was a wealthy man, thanks largely to bribes received while serving Rome as a provincial governor. When *curule aedile* in 58 B.C., he celebrated the public games on a scale of magnificence never seen before. For these sports he built a temporary theatre capable of accommodating 80,000 people, one of the most costly and largest buildings in Rome.*

* Books XXXIV and XXXVI.

3. Pompey the Great, conqueror of Mithridates, dedicated the gems of the latter, and some stones which he himself had collected, to the temple of the Capitoline Jupiter.

4. Votive offerings of gems and jewelry to the gods have been made from earliest times, first by prehistoric man and then the Sumerians and the Egyptians 2,000-3,000 years before Pliny's time. A list of such treasures in the Parthenon in the time of the Peloponnesian War is given in Boeckh's *Inscriptions*. Montfaucon* lists the jewels given to Isis by a Roman woman of means, Fabia Fabiana, in memory of her granddaughter, Avita. Such votive gifts and even the imperial jewels were not safe for Caligula, always in want of money, about 40 A.D. auctioned the imperial jewels saying, "This was my

* p. 136.

A ROMAN BOOK ON PRECIOUS STONES

father's: this was my mother's: this Egyptian jewel belonged to Antonius: this to Augustus," etc. It goes without saying that the buyers paid fancy prices for the jewels. In 170 A.D., Marcus Aurelius Antoninus auctioned the palace jewels, but for a noble purpose, to carry on the war against the Marconians.

* *J. Caes.* 47.

5. Suetonius* states that Julius Caesar always stood ready to pay high prices for fine old Greek engraved gems. He built a temple in his forum to Venus Genetrix as he claimed descent from Alba, son of Aeneas and grandson of Venus and Anchises.

6. M. Claudius Marcellus (43-23 B.C.) was the son of C. Marcellus and Octavia, sister of Augustus. The latter adopted him in 25 B.C. and Marcellus married the emperor's daughter, Julia. In consequence, it was assumed prior to his premature death that he would succeed Augustus. Virgil sang his praises in a well-known passage.*

* *Aeneid* VI, 860.



CHAPTER VI

1. Provided the chessboard was made of jasper, or another of the stones of the class we are inclined to call decorative, it could be duplicated today.

Pliny's fear that the mineral resources of the world were becoming exhausted is one that many mining engineers of today have expressed, at a time when mineral production is manifold that of Pliny's day. The fact that Pliny's engineering contemporaries held that the Carrara marble deposit would soon be exhausted (it has produced abundantly for the intervening 19 centuries) might well cause us to ponder before becoming too pessimistic in our prophesying.

Students of precious stone sources should at least be relatively optimistic regarding the long life of important mineral deposits. I cite our principal source of amber, the Prussian coast discovered 7,000 B.C., if not

Notes

earlier; the turquoise mines of the Sinai Peninsula, worked prior to 3400 B.C. and still unexhausted; the Badakhshan lapis lazuli mines, probably known as early as 3400 B.C.; the peridot mines of Zebirget Island, Red Sea, found between 1580 and 1350 B.C., and still mined in our time; the diamond mines of India, probably discovered between 800 to 600 B.C., and still a small producer. Ceylonese gem mining began about the same time. The Yemen and Indian agate mines were producing about 500 B.C., and those of Sicily, at the latest, in the 4th century before Christ. All three are still producing. The Khotan jade mines, still producers, were opened about 150 B. C.; and the Nishapur (Persia) turquoise mines probably about 1 A.D. The rock crystal of the Alps was known to Pliny and is still being recovered. The Whitby jet mines presumably have been producers for 2000 years, and probably much longer.

2. For various Greek and Roman sumptuary laws, see Introductory Chapter, *Roman Jewelry*.

3. Plutarch* states that Julius Caesar was deeply affected when he was convinced of Pompey's death. (He had fairly strong evidence; he was handed Pompey's head.) Caesar received Pompey's signet (the device, a lion holding a sword) with tears.*

4. According to Greek mythology, the gods drank nectar from golden goblets. Begemmed drinking cups, however, originated in the East, either India or Persia presumably. The Babylonians at Bismaya had drinking cups and other stone vessels, some of which were inlaid with precious stones, and these date from about 2400 B.C. Strabo (about 65 B.C.-21 A.D.) states that in festivals in India there were carried "drinking cups and lavers of Indian copper, most of which were set with precious stones such as emeralds, beryls, and Indian carbuncles." According to Parmenion's letters,* Alexander the Great's (356-323 B.C.) Persian booty included several goblets studded with gems: total weight, fifty-six Babylonian *talents* and thirty-four *minae*. Seleucus I, in the winter of 288-7 B.C., sent to Miletus gold and silver bowls, including "a barbaric (i.e. Persian) wine

* *Lives*, Wm. Mavor, translator, New York, 1835, p. 295.

* *The Hist. of Dio Cassius*, abridged by Xiphilin, translated by Francis Manning, London, 1704, Vol. I, p. 48.

* *Athenaeos* XI, 781.

A ROMAN BOOK ON PRECIOUS STONES

* C. Bradford Welles, *Royal Correspondence in the Hellenistic Period*, New Haven, 1934, p. 35.

* *Moral Characters*. Translator, Henry Gally, London, 1725, p. 265.

* *Stones*, Ch. 63 written about 315 B.C.

* Book XXXIII, Ch. 2.

* *Against Verres* IV, 27-62.

* *Elegy* V, III, 5.

* Book II, line 502.

* Book I, line 729.

† *Epithalamium on Pal-
lonius and Calerina*,
line 169.

* Plutarch, *Miscellane-
ous and Essays*, Wm.
W. Goodwin edition,
Boston, 1888, Vol. II,
p. 305.

cooler set with gems."* Menander (born 342 B.C.) in his play, *Four Brothers in Love*, speaks of "beakers set with gems."

Theophrastus* has his *Ostentatious One*, who served under Alexander the Great in Asia, state that "in the spoil which fell to his share, there were many costly vessels studded with gems." Theophrastus* further mentions cups set with emeralds. The Greeks, hence, had gem-set cups in the 4th century before Christ.

Among the Romans, gem-encrusted cups* were called *gemmae potariae* or *chrysendata*. They were probably introduced into Rome at least as early as 100 B. C. In a speech made in 70 B.C., Cicero accuses Verres* of stealing the gem-encrusted golden cups of the young Syrian prince, Antiochus. Lucretius (95-51 B.C.) states that the young bloods of his time wasted their patrimony on women's garments, feasts, and "goblets thick with many a gem." Gem-set cups were shown at Pompey's triumph. Cleopatra (69-30 B.C.) gave her dinner guest, Marc Antony, begemmed gold vessels. They are mentioned by Propertius* (50-15 B.C.); in Virgil's *Georgics** published in 31 B.C.; and in his *Aeneid*,* written about 19 B.C.; and by Claudian† 4th century A.D.). The rich Roman apparently at formal banquets displayed his gem-set silver- and goldware merely to prove he was more than prosperous. When dining alone with his family, he did not use them.*

Grattius Faliscus, broadly Virgil's contemporary, in his *Varieties of Hounds*, states that luxury caused the downfall of the pharaohs,

"Who Morea's wines in concave jewels drank."

This reference, however, probably refers to cups cut from a single stone rather than gem-encrusted cups.

The Chinese of probably more or less Pliny's time had jade wine jars, some of which would hold forty quarts.

Juvenal (55-138 A.D.), *Satire* X, lines 43-6, sings:

"More dangerous than peasants' cups.
Yet the frail vessels of the potter's wheel
No treacherous draughts of aconite conceal,
Fear the gemm'd goblet and suspicious hold
The ruby juice that glows in cups of gold."

Notes

The clients of the rich in Rome were accustomed to sharpen their nails in the hope of prying out a gem, apropos of which Juvenal writes* of a banquet given by Virro:

*"Its surface rough with beryls, chased in gold,
The amber goblet which the touch profane
Of the nefarious paw shall never stain!
To count the gems, a saucy slave stands by,
And marks your sharpen'd claws with curious eye.
Excuse his freedom, and, discreet, forbear
To handle much an emerald so rare.
Thus fashions change: till now the finger bore
The gem that graced the scabbard long before:
Now rings are in disuse, and beryls shine,
And rubies lend their ruddy light to wine."*

* *Satire V*, lines 65-76.



CHAPTER VII

1. The term *murrha* was apparently used for only a short time by the Romans, say from 61 B.C. to 222 A.D., some 283 years, and so far as I know is not mentioned by the gem authorities of the Dark Ages and medieval times. Pliny states that *murrhine* cups first appeared in Rome 61 B.C. as part of the spoils of Mithridates. Theophrastus (wrote about 315 B.C.) does not mention *murrha*, so the term originated between that date and 61 B.C. Appian* (lived early in the 2nd century of our era) enumerates among the plunder gotten as a result of Mithridates' defeat at Talaura, two thousand vessels of onyx. These without doubt were, or would have been in Pliny's time, included among *murrhine* vessels. It is rather strange that Horace (65-8 B.C.), steeped in luxury as he was, does not mention *murrha*.

Murrhine cups were used particularly for warm wine, crystal cups for cold drinks. Martial says,* "If you drink your wine warm, a Myrrhine cup is best for hot Falernian, and the flavor of the wine is improved by it." The latter statement is presumably equivalent

* *Bell. Mith.* 115.

* *The Epigrams*, Book XIV, Ep. 113.

to ours that "fine china adds flavor to food." In the *Chinese Tea Classic* (about 220-317 A.D.), it is suggested that tea be drunk from bowls "of ice (rock crystal?) and jade . . . which impart a tint of green to the tea." In another epigram,* Martial mentions "beautiful vases of mottled myrrha." Again, his host Pontius serves his guests wine in glasses while he himself drinks from a *murrhine* cup, in order that the former may not know that their host's wine is better than theirs.* The last passage indicates that *murrha* was not transparent, although probably translucent.

2. Pliny states* that in his day gold and silver have become commonplace, hence the "Romans dig from the earth murrha for vessels and rock crystal for vases, the very fragility of which increases their value. To own vases which can be destroyed in an instant is considered proof that the owner is a man of untold wealth." The brittleness which Pliny emphasizes may in part have been due to the thin walls of the vessels, as cut by the lapidaries.

So prized were these cups that Augustus chose as his part of the spoils of Alexandria a single *murrhine* cup. Agrippina, Nero's mother, decreed the death of a Roman senator in order that she might get his *murrhine* vases. Lucius Verus, who ruled with Marcus,* at his banquets presented "goblets of murra or of Alexandrine crystal" . . . to each guest "for each drink as often as they drank. Besides this, he gave golden and silver and even jeweled cups." Certainly a target in extravagance for the modern tycoon to shoot at.

Epictetus,* a contemporary of Pliny, in a discussion with a wealthy student of rhetoric, accuses him of using his time admiring crystal and *murrhine* vessels while Epictetus philosophizes. He evidently considered these vessels among the most valuable of Roman durable goods.

Marcus Aurelius (121-180 A.D.), when the Marcomannic War had drained the treasury dry, did not impose new taxes but "held a public sale in the Forum of the Deified Trojan of the imperial furnishings and sold goblets of gold and crystal and murra" . . . "and,

* Book V, Ep. 80,
also Book III, Ep.
82.

* Book IV. Ep. 85.

* Book XXXIII, Ch. 3.

* Julius Capitolinus,
*Scriptores Historiae
Augustae*. David
Magie, Loeb Classics,
Vol. I, Ch. 5.

* *Discourse*, translated
by George Long, Book
III, Ch. 9.

Notes

indeed, even certain jewels which he had found in considerable numbers in a particularly holy cabinet of Hadrian." So much was realized that when the war was over, he offered to redeem in cash any article the buyers wished to return.* Aelius Lampridius† tells us that the beastly Heliogabalus (Emp. 218-22 A.D.) had both *murrhine* and onyx vases which he used as "pot de chambre."

Cecilius Agricola, the most infamous of the flatterers of Plautian, a power at Severus' court (193-211 A.D.), after the death of the latter as a traitor, was condemned to death. Agricola went home, drank extremely cold wine to excess, then "broke a cup that cost 50,000 drachmas, lay down upon the remains" and opened his veins.* It would be of interest to know if this was a crystal or a *murrhine* cup.

Such vases and those of gold "set with gems" might well be stolen. In consequence, they were kept in costly gem-studded cabinets and at dinner parties were protected by guardians to count the gems and keep an eye on the guests' sharp fingernails.*

3. In Martial's time (40-104 A.D.), *murrhine* cups must have been relatively common, a single luxury shop displaying ten.*

4. T. Petronius, leader of fashion, quoted elsewhere in these notes, was once Nero's favorite, but later the two parted. As he was committing suicide by opening his veins in 66 A.D., "he broke his signet ring, that it might not be subsequently available for imperilling others."* As to his breaking his *murrhine* cups so that they would not fall into Nero's hands, see Pliny's text.



CHAPTER VIII

1. We now come to the difficult task of determining what *murrha* was, a controversial subject. In this commentator's opinion, *murrha* was a collective noun, like our "hard stone," which we use in describing the objets d'art of the Chinese lapidary. It is believed that *murrha* included not only agate and chalcedony and,

* Julius Capitolinus, *Scriptores Historiae Augustae*, David Magie, translator, XVII 4; also *Eutropius Abridgement of Roman History*, Bohn's Classical Library.

† *Scriptores Historiae Augustae*. Ch. 32.

* *Dio Cassius*, Francis Manning, London, 1704, II, p. 290.

* Juvenal, *Satires V*, pp. 37-45.

* Book IX, Ep. 59.

* Tacitus, *Annals*, XVI, 18.

in some cases, onyx and sardonyx, but also fluorspar. Cups of these gemstones have been found in the ruins of Rome, some doubtless cut in the East, others doubtless in the Imperial City itself. Elsewhere in Book XXXVII Pliny mentions cups of crystal and garnet. While he does not describe cups of amber, they were used in Britain long before his time and thereafter in Western Europe.* Both the Greeks and Etruscans had drinking cups of alabaster. *Murrha*, hence could scarcely include either crystal, garnet, alabaster, or amber. Cornelius Nepos (1st century B.C.) states that P. Lentulus Spinther (his contemporary) "had amphorae of alabaster the size of China wine vessels."* The Mayas of the 9th century A.D. had alabaster vases. *Murrha*, however, is evidently a mineral substance, as Pliny says it is dug from the earth.* Further, Pausanias,† who wrote about 174 A.D., states that waters of the River Styx bring death to man and beast, "for glass, crystal, murrhine vessels, and other articles men make of stone and pottery are all broken by the waters of the Styx."

Agate, onyx, chalcedony, and sardonyx were long known before Pompey's time and all four are described elsewhere in Book XXXVII, but it was from about Pompey's time that the earliest vases carved from these stones date. That some must have been of the quartz family seems evident from the fact that agates, onyx, and jasper are still found near Trebizond, that is, within what was once Mithridates' domain. Further, Appian* (about 95-165 A.D.) states that Pompey found in the city of Tauri, "which Mithridates used as a storehouse of furniture," "two thousand drinking cups of onyx welded with gold and many cups, wine coolers, and drinking horns." If, however, *murrha* included the quartz species previously long known, a new generic term for the material of the vases would scarcely have been introduced. Seneca perhaps makes similar distinction when he mentions the mules of the wealthy carrying "vases of crystal, murrha, and those carved by the hands of famous artists." (In this case, the last is probably sardonyx.) Also, Lampridius* distinguishes

* Martial IV, 32.

* Book XXXVII, Ch. 12.

* Book XXXVII, Ch. 2.
† Book VIII, Ch. 18.

* *Roman History*. Horace White, translator. Loeb Classics, London, 1912. Vol. II, p. 63.

* *Montfaucon*, Vol. V.

Notes

between the minerals onyx and *murrha* in the passage "*in murrhinis et onychinis minxit.*"

My reasons for including fluorspar in *murrha* are four: first, while it was known to the Romans and without doubt to those of Pliny's time, I can not identify it with any stone described by Pliny; second, the variations in markings and some of the colors, purple and white, as given in Pliny's description of *murrha*, apply to fluorspar; third, the odor given off by them;* and fourth, even a Roman consul could not have gnawed a cup cut from one of the quartz family, although to gnaw one of fluorspar would be altogether possible.

After becoming fashionable, *murrhine* cups became fairly common in Rome. Such being the case, we would expect to find in the ruins of Rome either the cups or their fragments. The former are rare, fragments of agate cups relatively common, while shaped and rough pieces of fluorspar are by no means unknown.

Two Roman vases of fluorspar found at Pompeii (that is of Pliny's time or earlier) are preserved in the Museum of Naples and the Vatican Museum has a Blue John dish of perhaps Roman Age.* The Museo Kircheriano also has a small, shallow fluorspar cup, presumably an antique. One of the pieces of fluorspar found at the Marmoratum was sawn into the slabs which line the high altar of the Church of Jesu in Rome. Michael Weinstein* states that fluorspar found in Pompeii resembles that of the Castleton, Derbyshire, mines which have produced most of the Blue John. Hodder M. Westropp* states that shortly before he wrote, blocks of fluorspar had been found at the Marmoratum, Rome, proving it was an import of Rome in Hadrian's time (a long generation after Pliny). Veneer-thin slabs of fluorspar, "well authenticated as of Imperial time and found near Rome are in the Museum of Practical Geology."* That fluorspar occurs in pieces large enough to cut into cups and vases is shown by the Blue John vases so popular in the Victorian period.

The mines of Derbyshire were worked by the Romans in the time of the Emperor Claudius* (in Pliny's time),

* Pliny as a Mineralogist, Introductory chapter.

* Cyril G. E. Bunt, *The Gemmologist*, 1937, Vol. V, pp. 29-31.

* *Gem News*, London, May, 1936.

* *A Manual of Precious Stones and Antique Gems*, London, 1874, p. 129.

* E. N. Bromehead, *Proc. of the Geologists Association*, London, 1945, Vol. LVI, pp. 89-134.

* R. G. Collingwood and J. N. Meyres, *Roman Britain and the English Settlements*, Oxford, 1936.

* Fred W. Burgess,
*Antique Jewellery and
Trinkets*, London,
1919, p. 369.

* Book IV, El. 51, 26.

* Book III, El. 10,
line 22.

* Translated by Wil-
fred H. Schoff, Lon-
don, 1912, p. 6.

* Book XXXVI, Ch.
67.

some of the old Roman lead workings have revealed traces of the mining of fluorspar, the two minerals occurring together.* Indeed, in Pliny's time Britain's potential lead production was so great that the maximum amount that could be extracted was fixed by law. The Britains mined lead in the days before the Roman occupation and the Romans operated the mines until about 320 A.D. Dated lead ingots of the period 44-169 A.D. are particularly common.

Pliny's knowledge was so encyclopedic that had porcelain been included in *murrha* in his time, he would have given us some clue to that effect. *Murrha* normally therefore, opposed to what some have held, did not include Chinese porcelain notwithstanding the fact that according to Sir William Gell, porcelain was known in the East as late as 1555 A.D. as "*Mirrha di Smyrna*." Some quote Propertius* (50-15 B.C.) "murrhine vessels baked on Parthian hearths" as proof that *murrha* was porcelain, but he elsewhere* links *murrha* and onyx which seems against the porcelain identification. The first quotation may well refer to the heat-treatment of agate to improve its color, perhaps known to the Hindus of Pliny's time. Fluorspar is also improved as to color by heat-treatments.

Pliny's sources, Parthia and Carmania, were doubtless trade stations on the caravan routes by which some of the cups reached Rome from India, then the great market for agate. Naturally, the Parthian merchants, until shortly before Pliny's time the sole purveyors of Indian luxuries, were not inclined to be too communicative as to the real source. Hence, some *murrha* was probably Indian agate, and, indeed, the word "*murrha*" is probably of Asiatic origin.

In the *Periplus of the Erythraean Sea*,* written in the 1st century of our era, we find among the Roman exports to the Abyssinian coast, "many articles of flint glass and others of murrhine." Here the substance is evidently the glass imitation of *murrha* mentioned by Pliny.* Among the exports from Barygoza (Broach, India), and produced in the country about it, is *onychine lithia kai mourrhine* which in this instance

Notes

Schoff translates as "agate and carnelian."* Would not onyx and *murrha* be better? The well-known Cambay agate and onyx locality is near, and Broach is still the most important trade center of the Indian agate industry.

* p. 193.



CHAPTER IX

1. The Greek word *crystallos* (from *Kpuos* "cold") was originally used for ice. As applied to rock crystal it was certainly used by Theophrastus (3rd century B.C.) if not by others previously.* We add, the 14th century reading of *Psalms* 147: verse 17, was "He sendis his kristall as morcels," our rendering, "He casteth forth his ice like morsels."

* Theophrastus, *History of Stones*, John Hill, London, 1746. p. 81.

2. One should perhaps here summarize historically the supposed influence of climate on the geographic occurrence of precious stones. The earliest references to gem occurrences admittedly were topographic rather than climatic. In an Accadian (Sumerian) hymn* antedating the 2nd millenium B.C. the god says: "I am Lord. The beetling mountains of the earth shake (their) hands to the foundations. (With) the mountain crystal (literally 'stone of the great light'), of lapis lazuli (literally 'blue stone') and of marble (literally 'white stone') my hand I fill." Agricola 3500 years later dedicated to the miners "the gloomy valleys and sterile mountains, that they may draw forth from these gems and metal."

* *Records of the Past*, London, 1874, Vol. III, p. 127.

The earliest reference to the function of the sun in improving minerals is that of Theophrastus in which he states that the side of the Lydian stone (touchstone) exposed to the sun is the better of the two.

The idea that gold and precious stones were particularly abundant in tropical countries is suggested in the classics and indeed Diodorus Siculus (1st century B.C.) lauds the perfection of the gems from tropical countries.

The theory, however, flowered in the Middle Ages.

The philosophers of that time knew that the intense heat of the tropical sun was the cause of the perfections of the gems. The idea originated in Greece and Rome, and, independently or not, we do not know, in the East, for in the *Book of Sindibad*, a Persian work more than a thousand years old, the king asks why his son is making such satisfactory progress in learning. A courtier ascribes the boy's progress to Sindibad, his teacher, "for if the sun withhold his glance, could the stone be converted into a ruby or a turquoise," a reference to the eastern belief that gems were common stones ripened during the ages by the sun's rays. Albertus Magnus, the great 13th century scientist, believed that seals made from stones from India and the East were medicinally more potent than those from less torrid regions, as the sun's and planet's rays fall directly upon the equatorial regions and obliquely upon those of the Temperate Zones.

Before Columbus sailed on his first voyage, Tocanelli, the astronomer, informed him that the East was the most fertile in all sorts of spices and gems and on his third voyage (1498), Columbus took a southerly course, as Jayme Ferrer, a learned jeweler who had traveled in the East, informed him that gold, gems, spices, and rare drugs were for the "most part to be found among black people near the Equator."* Raimondo di Soncino, in his second letter to his master, the Duke of Milan, (1497-8) states that on his next voyage Cabot hopes to reach "Cipango (Japan), situated in the equinoctial region, where he thinks grow all the spices of the world and also precious stones." Robert Thorne, writing from Seville in 1527 to Doctor Ley, British Ambassador to Charles the Emperor, says* that India and the nearby islands "abounde with Golde, Rubies, Diamondes, Ballasses, Granates, Jacincts, and other stones and pearles, as all other lands that are under and neere the Equinoctail. For we see where nature giveth anything she is no nigard." He adds as in our land "we have Jeat, Amber, Cristall, Jasper, and other like stones, so have they Rubies, Diamondes, Ballasses, Saphryes, Jacincts, and other like."

* John Fiske, *The Discovery of America*, Boston, 1892, Vol. I, pp.417, 489.

* Richard Hakluyt, *The Principal Navigations, Voyages, Traffiques and Discoveries of the English Nation*, Vol. II, p. 164.

Notes

Gold, "the perfect metal," according to the scientists of the Middle Ages, needed extreme heat for its formation. There were certain scoffers even in the Middle Ages, Camillus Leonardus (1502) stating that "no determinate Place is appropriated to the Generation of Stones."

Early in the 16th century Vannoccio Biringuccio, the famous Italian metallurgist,* stated that gold occurred in Scythia and "in those regions called oriental perhaps because the sun seems to shine forth with greatest vigor in those places."

Roger Barlow, writing in 1540-1,* doubts if Newfoundland will yield gold or precious stones as it is too far from the "equinoctial" where "the influence of the sonne doth norishe and bryng fourth gold, spices, aramatikes, and peritose stones." On his map, made in 1529, the Spanish cosmographer, Ribero, indicated that the region around the mouth of the Mississippi River was too far from the tropics to abound in gold. Gold being the "most perfect of all metals" was more abundant in hot climates; silver, copper, and lead requiring "less heat in their formation" occur in "cooler lands."* The geologists of the early part of the 19th century expressed their astonishment when in 1829 diamonds were found in the Urals far from the tropical regions.

Even in our generation, some writers on precious stones, after noting that the beauty of some gems from the tropics exceeds that of the same species from say Siberia, have ascribed the difference to the vertical play of the tropical sun or even to the more intense magnetic currents inferred to exist there rather than to geologic causes. One author believed that the superficial character of tourmaline deposits was due to the need of the sun's rays to perfect their form and color rather than to the fact that they occur in pegmatites, a most treacherously lenticular form of ore body. One geologic factor, however, favors the tropics as a gem producing region, namely, the more intense rock weathering there as opposed to the same process in the northern lands, permitting a greater concentration of gems in alluvial deposits. On the other hand, Camillus

* *Pirotechnia*, translated by C. S. Smith and M. T. Gnudi, A.I.M.E., New York, 1943, p. 28.

* *A Brief Summe of Geographic*, Hakluyt Society, 2nd series, London, 1932, Vol. LXIX, pp. 180-182. A summary of Martin Fernandez de Enciso's *Geography*, published in 1518.

* Johann Gottlob, *Traite de la Physique*, Paris, 1759.

Leonardus (1502), noting that amber was most plentiful on the "shore of the Northern Ocean," adds, "The gum is condensed in this climate by the Severity of Cold and by length of Time."

3. When Pliny states that rock crystal originates from intense cold he does not use his head nor is he consistent, for as sources he not only mentions the Alps but India and an island in the Red Sea, both with tropical climates, and in addition Asia Minor, Portugal, and Cyprus, regions of mild climates. Today Minas Geraes, Matto Grosso, and Goyaz in Brazil and, to a lesser extent, Madagascar are the principal producers of rock crystal.

The idea that rock crystal was, and is, ice is common to the peoples of both the Eastern and Western Hemispheres. It was believed by many authorities in Europe until the beginning of the 19th century, as it still is by some semisavage people. The idea is largely mnemonic but is partly of geographic origin, particularly owing to the important occurrence in the Alps, one of the earlier known localities. The Hebrew word *kerach* in the Old Testament normally signifies "ice" or "frost" but in places "crystal."* Seneca,† who wrote a generation before Pliny, considered crystal frozen water. The fathers of the Church, Austin, Jerome, Basil, and Gregory the Great* supported the conclusion as did Scaliger. St. Jerome* states that crystal forms in dark, intensely cold mountainous caverns: "while a stone to the touch, it seems like water to the eye." Claudian (4th century A.D.) says crystal is "ice hardened into stone which no frost could congeal nor dogstar dry up." We quote his *Epistle II to Serena* (lines 7-8):

*"From Causasus' high summit, brought
And griffons gold in northern regions sought."*

His contemporary, Ko Hung, a famous Taoist doctor, wrote "Out from the Mountain that produces Jade a liquid flows which in 10,000 years congeals into crystal." Isidore of Seville (died 636 A.D.) says crystal is "snow that is hardened into ice in the course of years."*

Sir John Mandeville, the Baron Munchausen of the

* For instance, Ezekiel 1:22.

† *Quaest.*, Nat. III, 25.

* *Commentary on Prophecy of Ezekiel*
* *Sancti Eusebii Hieronyma, Opera Omnia*
Ed. Magne, Paris, 1865, Vol. IV, Col. 545.

* Ernest Brehaut, *Studies in Hist. etc.*, Col. Univ. 1913, Vol. 48, *An Encyclopedist of the Dark Ages*, p. 254.

Notes

14th century, states that northern India is so cold that "for pure cold and continual Frost, the water becometh Crystal."* John de Trevisa in 1398 wrote "Men trowe that snow or yse is made hard in space of many yeres: therefore, the Grekys yaue (gave) this name thereto." Agricola (early 16th century) in his *De Orto et Causis** says "we know that stones which melt by fire, such as quartz, solidify by cold." Other adherents were Bishop Epiphanius (4th century), Theophilus (11th century), Bishop Marbodius (1067-81), Bartholomew Angelicus (13th century), Lord Bacon* (died 1626), De Boot (1636), Nicols (1653), and A. Caire (1833).

The name for crystal in both China and Japan, *suisho*, indicates that these eastern people believed crystal to be congealed ice.

Among the Ojibway, white flint was known as *mik-kwum-me-waw-beek* or "ice stone."* Among the wonders supposedly performed by one of the Mandan medicine men was rolling a snowball a long time in his hands till it was converted into a hard white stone "which when struck emits fire."* The Eskimos of Alaska believe that quartz is "the centers of ice masses frozen so hard that they become stone."* According to the natives of Kashmir at Shahabad* ice formed in the winter in a cave near the village "was changed, it was said, to solid crystal on being brought into the air." Moorcraft, however, suggests that the reference is to stalactites rather than rock crystal. At Cashgar, Sir Alexander Burnes* says a wandering jeweler "purchased rock crystal (belcor) from the shepherds who in their simplicity believe it to be frozen ice of a hundred years."

If Pliny held that crystal was congealed water, Diodorus Siculus,* on the other hand, believed that gems were "produced by the Influence of the Sun," as was rock crystal: "By heat of the Sun likewise are produced Rubies."* Solinus (3rd century) while usually a mere copyist of Pliny, states that crystal is not congealed ice, since it is found in hot countries."* Vannoccio Biringuccio (1480-1539), the Italian metallurgist, also doubted that rock crystal was either frozen water or snow.* Sir

* Aldine edition, New York, 1899, p. 97.

* *De Re Metallica*, Hoover translation, London, 1916, p. 51.

* *Sylva Sylvarum*.

* *Narration of the Captiv. of John Tanner, etc.*, prepared by Edwin James, M.D., New York, 1830, p. 358.

* Maximilian, Prince of Weids, *Travels in the Interior of N. America*, 1832-4. *Early Western Travels*, edited by R. G. Thwaites, Vol. XXIII, p. 342.

* Nelson, 18th An. Rep. Bur. of Am. Ethnol., Washington, 1899, p. 466.

* Moorcraft, *Travels in the Himalayan Provinces*, London, 1841, Vol. II, p. 252.

* *Cabool—in the years 1836-8*, London, 1842, p. 219.

* G. Booth, *The Hist. Library of Diodorus Siculus made English*, London, 1700.

* As to the classical and medieval belief that gems were produced by heat of the tropical sun, see Sydney H. Ball, *Gemmological News*, London, June, 1941.

* *Solinus Polyhistor*, translated by Arthur Golding, Gentleman, London, 1590, p. 48.

* *Pirotechnia*, A.I.M.E., New York, 1943, pp. 119-20.

A ROMAN BOOK ON PRECIOUS STONES

* *Vulgar Errors*, 1646.

* *De solido intra
solidum naturaliter
contento*, Florence,
1669, English trans-
lation, 1671.

* *China and the
Roman Orient*,
Leipzig, 1885, p. 239.

Thomas Brown* says it was still "common opinion" in his time that rock crystal is "nothing else but ice or snow concretion and by duration of time congested beyond liquidation." Nicholas Stena* (1631-87 A.D.), on the other hand, wholly rejects the ice theory of origin but believed tiny particles were added to the outside of crystals. He recognized also the constancy of angles in rock crystals. Among others who opposed the idea, most of them before Stena, were Cardanus, Anselmus Boetius, Cassius, Bernardus, and Sennertus.

Cryolite is considered hardened ice by the Greenland Eskimos. The Romans, believing that crystal could not endure heat and that it was formed from ice, used crystal goblets for their cold drinks and *murrhine* cups for hot. F. Hirth* quotes an ancient Chinese work *Po-Wu-Yan-Lan*, as follows: "No hot soup or boiling water should be poured into a vessel made of *shui-ching* (rock crystal), lest it burst as if it were smashed to pieces."

4. Crystal today is obtained commercially from all three of the sources mentioned, that is, in place, in residual deposits, and in stream gravels, but particularly from the second.

5. That crystal occurs only on southern slopes and never in humid spots is false.

6. An accurate crystallographic description. Many crystal faces possess a high natural polish, for example, the Herkimer County (N.Y.) crystals.



CHAPTER X

1. Fine rock crystal blocks of 150 pounds, while large, are not unique. A vase holding one *amphora* (almost six gallons), if of fine quality, would be large, although perhaps it did not surpass the bowls of Lucius Verus, a friend of Marcus Aurelius, which were so large that no man of the day could empty them at a single

Notes

draught. As to man's capacity, I do not pretend to be a judge.

In the Vienna Imperial Library, in the 17th century, there was, per report, an urn "made of one piece of crystal a yard and a half high."*

In 1719, a cave on the Zinkenstock, near Grimsel, in the Bernese Oberland, containing a number of gigantic crystals was found, the largest weighing about 800 pounds. From a cave in the Vieschthal in Upper Valais, one was found weighing 1400 pounds. At Fischback, Switzerland, in 1797, a crystal was discovered which was used in the pyramid of Marsfeld. It was three feet in diameter and weighed more than 800 pounds. It is now in the Natural History Museum, Paris. In the museum, Berne, are some large crystals from Galgenstock, Switzerland, a locality found about 1867. The crystal "Grandfather" weighs 276 pounds and "The King," 255 pounds.* A block of rock crystal in the Museum of Milan weighs 870 pounds. In the early 1920's, an exceptionally fine rock crystal was found in Burma. From it was cut the magnificent crystal ball now in the United States Natural Museum in Washington, thirty inches in diameter and weighing 130 pounds. The ball was shaped in China and given its final polish in Japan. In 1927, a mass of rock crystal weighing 528 pounds was found in Brazil.

2. The risks taken by the Swiss *strahlern* (crystal hunters) are proverbial and are still recounted in books of travel. Like the jet miners of Whitby, they are frequently let down cliffs by ropes. Likely places to prospect are located by sounding with an iron rod, one of the earlier forms of geophysical prospecting.

During World War I jet partly regained its dwindling vogue. Whitby, Yorkshire, is still the cutting center, but the local sources of supply have been largely supplanted by the more prolific Spanish sources. At Whitby, although some jet was picked up along the seashore, most of it was mined by tunnels. In prospecting, a man was lowered over the cliff by a bowline around his waist and if jet was found, footholds were dug in the cliffside to the proposed site of the tunnels. Not

* Dr. Edward Browne,
*A Journey from
England to Holland,
Harris Voyages, 1668,*
pp. 752-3.

* Edwin W. Streeter,
*Precious Stones and
Gems, London, 1887,*
p. 293.

only were these precipitous stairways dangerous in themselves, but rocks from above not infrequently took their toll of miners' lives. Madame de Barrera states that the emeralds of the Salzburg Alps, Germany, are imbedded in the face of two cliffs, the seeker lowering himself by means of ropes, in which perilous position "he detaches with his tools the emeralds."

3. Pliny's description of flaws, liquid and other inclusions, and iron-stained fractures is accurate.

This "humour" may be water, a hydrocarbon, carbon dioxide, etc.

4. See *Roman Jewelers and Lapidaries* (Introductory Chapter) as to hiding of the defects of gems by skillful cutting.

5. As the lapidaries of Pliny's time were not expert at faceting stones, we can readily understand why some quartz crystals were set uncut. Some of the Herkimer County, N. Y., crystals set uncut would make a fine show. *Aconteta* means "without flaw." *Acentela* is today the Spanish word for fine rock crystal.

6. The physicians of Pliny's time evidently realized the value of globes of rock crystal as burning glasses since spherical or lenticular masses of crystal concentrate the sun's heat. The Pueblo Indians used them to light their ceremonial fires.*

* Book XXXVI, Ch. 67.

There is a poem, reputed to be by Onomacritus, a Greek who, as some state, wrote about 516 B.C., in which exact directions are given as to producing holy fire. The poem, however, is more likely of our era. Place a bright transparent piece of rock crystal on dry wood in brilliant sunshine; first smoke, then a tiny smoldering fire; finally, a burst of flame. "Who enters the temple with this holy fire cannot be refused by the gods." He adds that, after kindling the sacred fire:

*"Yet though of flame the cause, strange to be told,
The stone snatched from the blaze is icy cold."*

But even if the earlier date cited above were correct, the principle of a burning glass was known much earlier. A rock crystal lens 1.6 inches long, 1.4 inches broad, and 0.9 inches thick, presumably turned on a lathe, was found by Layard at Nimrud, associated with

Notes

glass, bearing the name of Sargon (3800 B.C.) Was it used by the lapidaries or perhaps by the astrologers, or merely by wise men reading the characters on clay tablets? * Sir David Brewster believed it a magnifying glass. Lenses of rock crystal, possibly magnifying glass, have been found in Crete dating from 1600 to 1200 B.C.

Aristophanes' character, Strepsiades, in the *Clouds** has had a claim of five *talents* brought against him. He tells a friend that he knows a stone, "the beautiful and transparent one, from which they kindle fire," which will concentrate the sun's rays on the waxen tablet and "liquidate" the charge as rapidly as the court clerk writes it down. Seneca knew the magnifying power of transparent globes, for he says, "letters, however small and dim, appear large and clear when viewed through a glass globe filled with water."*

Plutarch (46-120 A.D.) among others,* states that Democritus, one of the greatest of early Greek scientists (born 460 B.C.), in order not to be distracted, blinded himself by means of a burning glass. The grande dames of Rome used to cool their hands in summer with small spheres of rock crystal. Anyone who has handled crystal balls would recognize that this was efficacious. We quote Propertius* (50-15 B.C.), whose mistress, Cynthia, was a grasping wench:

*"She'll now a fan of peacock's plumes demand;
And now a crystal ball to cool her hand.
Further she will pray
For glittering baubles of the Sacred Way."**

The Roman lapidaries in rare instances fashioned crystal in the round. Thus, the Neapolitan architect, Ligorio, states that in 1550 A.D. he found a crystal statuette of Venus in the so-called Temple of Venus and Cupid, Rome.*

7. These were, according to Suetonius, his Homeric cups, so-called because scenes from Homer's works were engraved on them. Previously Titus Petronius, his social mentor it will be remembered,—feeling that death approached—had broken a crystal drinking cup (worth 3415 pounds) to keep it from falling into Nero's

* Austin H. Layard, *Discoveries in the Ruins of Nineveh and Babylon*, New York, 1853, pp. 197-8.

* First produced 423 B.C., lines 760-75.

* John Clark, *Physical Science in the Time of Nero . . . Quaestiones Naturales of Seneca*, London, 1910, p. 29.

* Wm. W. Goodwin, *Miscellaneous*, Boston, 1888, Vol. II, p. 440.

* *Elegy XV.*

* *Via Sacra*, Rome's swank jewelry quarter.

* Rodolfo Lanciani, *The Ruins and Excavations of Ancient Rome*, Boston, 1897, p. 398.

* John Arbuthnot,
*Tables of Ancient
Coins, Weights, and
Measures*, London,
1727.

* Berthold Laufer,
Jade, Chicago, 1912,
p. 33.

* Warmington Com-
merce, *Roman Empire
and India*, p. 245.

* J. B.de Serviez,
*The Roman Em-
presses*, Molesworth
Translation, New
York, 1925, Vol. I,
p. 60 f.n.; Seneca,
De Ira III, 40; Dio
Cassius, liv. 23, Man-
ning edition, p. 161.

* Julius Capitolinus,
*Scriptores Historiae
Augustae*, XI 6.

hands.* Sun K'uan (181-252 A. D.) had just condemned to death the father of P'an Fu-jen when he was shown the latter's picture. He at once exclaimed: "This is a divine woman," and striking his amber *Ju-i*, or scepter, on the table, broke it into a thousand fragments.*

8. It is stated that the Roman rich had special keepers of their crystal cabinets and had individual names for each of their crystal cups.*

Augustus (31 B.C.-14 A.D.) raised the freedman Vedius Pollio to knighthood. At a dinner given by Pollio to Augustus, one of the former's slaves by chance broke a fine vase of crystal. Pollio ordered him thrown to man-eating eels, the breeding of which was his hobby. The slave appealed to Augustus, who in vain asked for the slave's life. The emperor then added: "I should like to see the other cups and precious vases which you possess, so that I may enjoy them." He then ordered all broken to fragments. Dio adds: "So Pollio, forgetting his irritation over the breaking of one cup, on seeing the destruction of so many, and no longer venturing to punish his slave for an act which the emperor also had committed, rightfully pardoned the boy."*

Verus, coemperor with Marcus, was not only a dispenser of *murrhine* drinking cups, but "among other articles of extravagance he had a crystal goblet named Volucer, after that horse of which he had been very fond, that surpassed the capacity of any human draught."*

When Baghdad was almost taken from the Caliphate and Al-Amin had only a tower left (813 A.D.), he summoned a woman singer, who only sang dolefully. He ordered her peremptorily away. She stumbled; broke in fragments a priceless crystal goblet. "See, all are against me and the end is near," he cried. He tried to escape, was captured, and beheaded.

The Milanese medieval artists cut particularly beautiful vases of rock crystal which even Cellini thought worthy of mounting.

King Rene D'Anjou (15th century) was a famous

Notes

collector of crystal objets d'art. Among them was a wine cup engraved with the following:

*"Que bien beurra
Dieu voira
Qui beurra tout d'une baleine
Vaira Dieu et la Madeleine*

*(Whoso drinks me
God shall see
Whoso at one good breath drains me
Shall God and the Magdalene see).**

9. While rather fragile, if badly flawed, unfractured rock crystal cups should be able to stand considerable temperature changes. As to the fragile nature of crystal cups, Martial* writes: "You break crystal cups in your anxiety to avoid breaking them."

10. Similarly, when synthetic rubies and sapphires came on the market a generation ago, the price of real gems temporarily fell, but they are now valued much more highly than previous to the development of synthetic gems. Martial suggests the existence of imitation crystal vases in his day.*

* E. Staley, *King Rene D'Anjou and his Seven Queens*, New York, 1912, p. 26.

* Book XIV, Epigram III.

* Book IX, Epigram 59.



CHAPTER XI

1. Homer* is the first classical author to mention amber. In each case reference is to chains strung with amber beads, the gifts of Phoenicians, the early merchants in amber.

The Roman name, *succinum*, from *succus* (juice), indicates the early belief regarding the vegetable origin of amber. The root lives in our succinic acid. Our word "amber" comes through the Spanish from the Arabic *anbar*. This latter originally referred to ambergris rather than to amber; hence we can understand that in the Middle Ages writers confused the two.

2. At present much amber is used by men as mouth-pieces for pipes and cigarholders. The commentator

* *Odyssey*, Book XV, 460 and Book XVIII, 295.

cannot understand why Pliny was unwilling to concede a high value to a beautiful and relatively rare material like amber.

3. The Phaethon legend, an early Greek concept, was first recorded by Aeschylus (469 B.C.) and Euripides (480-406 B.C.). The latter* states that the "sad sisters of Phaethon, in pitiful tears, weep amber glinting drops into the swell."* Diodorus Siculus also gives the Phaethon myth in considerably greater detail.* Claudian (4th century A.D.) mentions the myth in four different poems.* M. Aurelius Olympius Nemesianus (end 3rd century A.D.), in his *Cynegetica** mentions the Heliades "trees forever weeping by reason of a brother's death." John Milton* (1608-1674) recites the tale. Henry H. Milman (1791-1868) in *Samor** refers to the legend thus:

*"Him the Thunderer hurled
From the empyrean headlong to the gulf
Of the half-parched Eridanus, where weep
Even now the sister trees their amber tears
O'er Phaethon's untimely death."*

Virgil* states, "The tamarisks distil rich amber from their barks."

In this ancient myth we have evidence that the early Greeks considered amber a gum or resin. Scymnus of Chios* described amber as a resin of the black poplar. Georgius Agricola* asks, "How can amber be derived from trees; seeing that it is thrown forth from the sea? No trees grow in the sea." He holds that all ancient theories of its origin contradict one another. "Fortunately they are all wrong." To him, amber is bitumen exuding from springs at the bottom of the sea. Schweigger (1819) finally and for all time proved amber to be the fossil resin of a pine tree, a conclusion Pliny had reached some 1750 years before.

4. That precious stones are tears is a common mythological concept. For example, according to the Buddhists, the rubies and sapphires of Ceylon are Buddha's tears, caused by man's sins. A Singhalese legend, however, holds that the gems of Ceylon are Adam's tears hardened. Chinese mythology holds that

* Hippol. 735.

* See also Ovid, Met. B II, p. 340.

* G. Booth translation, London, 1700, pp. 185-6.

* Pan. 3rd Consulship Hon.; Fesc. Hon. Mary; Epistle II to Serena; and Pan. 6th Consulship Hon.

* Lines 34-7.

* Some new stanzas, p. 95.

* Book XI, lines 800-4.

* Eclogue VIII.

* Letronne, probably 1st century B.C., V. 396, p. 367.

* de Natura Fossilim, 1546, Ch. 9, pp. 479-80.

Notes

pearls are the tears of mermen and mermaids. According to the earliest cosmogony of the Japanese, given in an ancient book *Koji-ki*, the god Izanagi and the goddess Izanami, created the earth. Standing on the bridge of heaven, they stirred the ocean with a spear, the drops from which consolidated into the islands of Japan. An old legend of the Caucasus Mountains states that diamonds are the tears of a youth, Lord of the World.

In the lava of the Island of Hawaii occur small hemispheres of aragonite resembling pearls. Locally they are known as "Pele's tears," as Pele, the goddess who ruled the great volcano, Kilauea, is said to have wept tears when she thought the subterranean fires were dying. Her tears, falling into the lava, solidified into the likeness of pearls, i.e., these aragonite hemispheres. In Scandinavian mythology, amber, pearls, precious stones, and precious metals are the congealed tears of the goddess Freyja.* Gold, according to the Peruvian Indians of pre-colonial days, was the tears wept by the sun. The Virginia mountaineer considers the staurolite cruciform twin crystals tears which the fairies wept at Christ's death.

The Black Stone of the Kaaba, Mecca, was a pagan fetish long before Mohammed's day. According to the Mohammedan teachers, it was originally white and so brilliant that it dazzled one's eyes at a distance of four days' journey. It has, however, wept so long and so copiously for the sins of mankind that it first became opaque and at last black.* According to Mohawk legend, the rock crystals near the village of Lansingburgh, N. Y., are the tears of a pure Indian woman, Me-ne-ta by name, who, with her devoted son, was struck by lightning.*

5. The Greek name *electrum*, from *elector* the sun, probably of Phoenician origin, suggests that the Greeks first got amber from Phoenician traders. While the Electrises are usually placed at the mouth of the Po, again opposite Britannica (England and Scotland), Pliny states that in the German Sea "are those (islands) known as the Glaesariae, but which the Greeks have more recently called the Electrises from the circum-

* MacKenzie, *Ancient Man in Britain*, p. 161.

* Niebuhr Carsten, *Travels in Arabia*, Pinkerton's *Travels*, Vol. X, p. 90.

* Nathaniel B. Sylvester, *Hist. Sketches of Northern New York and the Adirondack Wilderness*, Troy, 1877, pp. 219-20.

* Book IV, Ch. 30.

stance of their producing amber.* *Electrum* was also applied to a yellow gold-silver alloy, much used by the Greeks. It is usually stated that amber got this name from the alloy but since, of the two, amber was first used by man *the reverse is likely to be true*.

6. The supposed location of the Electrides in the Adriatic Sea near the mouth of the Po is merely another example of the source of a gem being confused with a locality important in its commerce. The mouth of the Po was the terminus of one of the great trade routes by which Baltic amber reached the Mediterranean countries.

7. Theophrastus* says amber "is dug out of the earth in Liguria" and while Liguria as a source is apparently looked upon with suspicion by Pliny, Strabo* (about 65 B.C.-21 A.D.) states: "In their (the Ligurians) country likewise there is plenty of lingurium, called by some electrum." Amber is found at several places near Marseilles, not much to the west of the old Liguria (Saint Paulet in Department du Gard and Aix in Department of Bouches-du-Rhone, France).

8. Amber is not to my knowledge known to occur in Aethiopia but the specific mention of Ammon's temple suggests that this is not a case where Aethiopia and India were confused. Possibly it is an old source, or perhaps some related resin is referred to.

9. There are several unimportant amber localities in Russia.

10. That amber is the urine of the lynx, male or female, is an extraordinary instance of mnemonic suggestion as to origin. The myth is an old one as Theophrastus, who wrote in 315 B.C., ascribes it to his predecessor, Diocles. Demostratus, an old Roman historian and senator, repeats the tale. The story is retold later by Pliny as to *lyncurium*,* this time regarding what appears to be our tourmaline. Sudines, convinced that amber is of vegetable origin, introduces his own version of the lynx legend: a tree growing in Etruria called "lynx." The tale lived on into the Middle Ages, and we find Roger Barlow* writing in 1540-1 that *lyncurus* was the "uryne congeleth" of the lynx.

* *History of Stones*,
John Hill, London,
1746, p. 76.

* Book IV, Ch. 6,
p. 2.

* Ch. 13.

* *A Brief Summe of
Geographie*, Hakluyt
Society., 2nd Ser.,
edited by E. G. Tay-
lor, London, 1932,
Vol. LXIX, p. 94.

Notes

The myth strikes me as a gem dealer's tale to enhance the value of the gem by emphasizing the difficulty of finding it. It may be added that among the Zuni, turquoise is the urine of one of their chiefs.

The variants of the Phaethon, Electrides lynx, and bird myths given in the succeeding paragraphs are most interesting.

11. The British Isles still occasionally produce a little amber and they presumably were a larger producer in Pliny's day. Strabo, however, states that amber was imported into Britain in his time,* i.e., a generation or two before that of Pliny.

12. Aestii, the German tribesmen of the amber coast, were well pleased with the price they got from the Romans for their amber. In Book IV, Pliny gives some supplementary data as to Baltic amber occurrences. In Chapter 27 he quotes Timaeus as stating that amber is thrown up by the waves in the springtime on an island which he here calls Raunonia and not Basilia as in Chapter 11, Book XXXVII. Diodorus Siculus* agrees that the island is called Basilia. The islands which the Romans called Glaesariae were known to the barbarians as Austeravia and Actania. These islands* have more recently been called by the Greeks, Electrides. Long after Pliny's time, the Aestii sent amber in quantity to Theodoric, king of the Ostrogoths (454-526 A.D.) to gain him as an ally. He writes:* "It is gratifying to us to know that you have heard of our fame and have sent ambassadors who have pressed through so many strange nations to seek our friendship.

"We have received amber which you have sent us. You say that you gather this lightest of all substances from the shores of the ocean, but how it comes thither you know not. But, as an author named Cornelius (Tacitus) informs us, it is gathered in the innermost islands of the ocean, being formed originally of the juice of a tree (thence its name *succinum*) and gradually hardened by the heat of the sun.

"Thus it becomes an exuded metal, a transparent softness, sometimes blushing with the color of saffron, sometimes glowing with flamelike clearness. Then,

* Book IV, Ch. 3, art. 5.

* V. 23

* Ch. 30.

* *The Letters of Cassiodorus*, translation and introduction by Thomas Hodgkin, London, 1886, pp. 265-6.

gliding down to the margin of the sea and further purified by the rolling of the tides, it is at length transported to your shores to be cast upon them. We have thought it better to point this out to you, lest you should imagine that your supposed secrets have escaped our knowledge.

"We send you some presents by our ambassadors and shall be glad to receive further visits from you by the road which you have thus opened up, and to show you your future favors."

Could the use by the *gutones*, the collectors according to Pytheas of amber as fuel, refer to its ritualistic use, replacing the splinters of pine wood once used by the Greeks and Romans in starting the holy hearthfire? The German name *bernstein* sufficiently indicates the inflammable nature of amber. This name originated at latest in the early Middle Ages. It was then burnt as incense; hence the name from the Low German word *bernen*, to burn. In many other lands it has been burned as incense.

13. That some precious stones are congealed sweat is a myth known elsewhere.

14. This early reference to amber from India is interesting, as Burma is today a relatively important producer. Ctesias wrote about 398 B.C. The Burmese amber mines were known to the Chinese at an early date. To quote from the annals of the Later or Eastern Han Dynasty (25 A.D.-220 A.D.). "Ai lao (Chinese name of ancient Shan kingdom in Burma) produces both pearls and amber."*

* N. M. Penzer, *The Mineral Resources of Burma*.

Sacal, I understand, in Hebrew means rock or stone.

15. *Harpax* (from the Greek, "to drag") is the analogue of *karabe*, a Persian word meaning "that which attracts straws," a name sometimes applied to amber in the Orient. From *karabe* we get the Italian *carábe*; the Portuguese *carabe*, and the French *carabé*, all applied to yellow amber. That *karabe* was another name for amber was known to Leonardus (1502 A.D.). These names remind us of the name *aschen-trecker* (ash drawer), given to tourmaline by the Dutch when the precious stone was first recognized by them in 1703.

Amber pits existed on the coast of Lebanon in Phoeni-

Notes

cian time.

16. Amber occurs near Santander in Spain.

17. While the pine trees from which amber is obtained are not old geologically, they certainly were not living in Mithridates' time.

18. As to Sophocle's idea that amber was the tears of the birds *meleagrides*, we quote Thomas Moore's *Fire Worshipers*:

"Around thee shall glisten the loveliest amber
That ever the sorrowing sea-bird hath wept."

19. *Glaesum* comes from the old German word *glez*, the Anglo-Saxon form being *glaer*, both forms referring to its brightness. From this root we get our "glass" and the verb "to glare."

20. Pliny's description of the origin of Baltic amber is very close to our modern views. The extinct pine which exuded the resin is *Pinus succinifera*. Amber is so light (average specific gravity 1.08) that it frequently is found entangled in seaweed washed upon the coast after storms. Provided it is cellular, it floats and even ordinary amber will float in very briny or in churning water. Indeed, the Finnish and Esthonian names *meri-kiv* and *merre-kivvi*, respectively mean sea stone. Dionysus Halicarnassus in the 1st century B.C. gave the Samland coast as the source of amber.

Tacitus* says: "The Germans explore the sea for amber, in their language called *glese*, and are the only people who gather that curious substance. It is generally found among the shallows, sometimes on the shore. Concerning the nature or the cause of this concretion, the barbarians, with their usual want of curiosity, make no inquiry.

"Amongst other superfluities discharged by the sea, this substance lay long neglected till Roman luxury gave it a name and brought it into request.

"To the savages, it is of no use. They gather it in rude heaps and offer it for sale, without any form of polish, wondering at the price they receive for it. There is reason to think that amber is a distillation from certain trees, since in the transparent medium we see a variety of insects, and even animals, on the wing,

* *On the Germans*.
Murphy translation,
1793, Ch. 45.

which, being caught in the viscous fluid, are afterward, when it grows hard, incorporated with it.

"It is probable, therefore, that as the East has its luxurious plantations, where balm and frankincense perspire through the pores of trees, so the continents and islands of the West have their prolific groves whose juices, fermented by the heat of the sun, dissolve into a liquid matter which falls into the sea, and, being there condensed, is afterward discharged by the winds and waves on the opposite shore.

"If you make an experiment of Amber by the application of fire, it kindles like a torch, emitting a fragrant flame and, in little time, taking the tenacious nature of pitch or resin."

While the father of history, Herodotus, had heard the tale that amber was procured from the river Eridanus, which enters the Northern Sea, he is a bit skeptical as to the word *Eridanus*. Grudgingly, however, he concludes, "Nevertheless, tin and amber do certainly come to us from the ends of the earth."

Pliny, in emphasizing that the overland trade in amber from Germany to Italy debouches on the Po, cleverly ties into that river the reason for the myth of the amber-weeping poplars of the Po.

21. This member of the equestrian order belonged to that select group of gem explorers with Marco Polo, Tavernier, and Chardin.

22. The thirteen pound piece of amber brought to Rome by this knight in Nero's time was a large piece. One of twenty-seven pounds is said to have been once found in Jutland. The finest one exhibited, before World War II at least, in the Royal Mineral Cabinet in Berlin weighed thirteen and one half pounds. The same museum is supposed to have had a record piece weighing almost twenty-one pounds and worth \$30,000. About twenty years ago, on the Prussian coast near the Noble Gate of Altona, a piece of amber was recovered weighing eight and one half kilos (eighteen and three fourths pounds. In the cabinet of Canon Manfredi Settala, Milan, was said to have been shown a dish of yellow amber two feet in diameter.* This

* *Travels of Mr. Maximilian Mission, Harris Voyages*, 1678, Vol. II, p. 583.

Notes

dish, however, might well have been a composite made of several pieces of amber. Pausanias (about 174 A.D.) saw in the temple of Olympia a statue of the Emperor Augustus in amber; size not specified.*

* Book V, Ch. 12.

23. Again, Pliny's scientific deductions are keen, but in this he was preceded by Aristotle* (384-322 B.C.): "For amber also and the bodies called 'tears' are formed by refrigeration like myrrh, frankincense and gum. Amber, too, appears to belong to this class of things. The animals enclosed in it show that it is formed by solidification." Tacitus, from the insects enclosed in it, believed amber a vegetable sap.

* *Meteorologika* IV, 10.

Martial, in one of his epigrams,* says regarding an ant enclosed in amber:

* Book VI, 15.

*"So she that was in life despised,
In death preserved, is highly prized."*

And again,* regarding a bee so entombed:

* Book IV, 32.

*"Its many toils have earned a guerdon high,
For such a tomb a bee might wish to die."*

In a similar vein is the following:*

* Book IV, 59.

*"On weeping poplar boughs a viper crawls,
An amber drop upon the reptile falls,
Amazed she feels the gummy chains around,
But in their hardening mass she's safely bound,
Her royal tomb Cleopatra need not prize,
For in a nobler one a viper lies."*

Martial in this last instance was presumably drawing on his imagination or had in mind a false piece, as vipers are unknown in true amber. Of course, on the same ground, we may question Pliny's lizards. Camillus Leonardus* (1502) says of inclusions "and sometimes Deceivers will soften Amber and put into it some extraneous Matter." So the trick is at least well over 400 years old. Frogs, lizards, and fish in amber, if they exist, have presumably been put there by fraudulent dealers.

* *The Mirror of Stones*,
London, 1750, p. 227.

Francis Bacon* (1561-1626) says: "The Spider, Flye and Ant being tender, dissippable substances, falling into Amber, are therein buried, finding therein both a Death and Tombe, preserving them better from Corruption than a Royal Monument."

* *The Historie of Life
and Death*, p. 283.

A ROMAN BOOK ON PRECIOUS STONES

Swift, in a letter to Pope, writes: "Sir, you remind me of Lord Bolingbroke's ring; you have embalmed a gnat in amber."

We have this from Pope (1688-1744) himself:

*"Pretty! in amber, to observe the forms
Of hairs, or straws, or dirt, or grubs, or worms,
The things, we know, and neither rich nor rare,
But wonder how the devil they got there."**

* Ep. to Arbuthnot.

and from Herrick (the thought is better than his Grecian-tinged science):

*"A drop of amber from a poplar plant,
Fell unexpected, and embalmed an ant;
The little insect we so much condemn
Is from a worthless ant, become a gem."*

Early in his congressional career, Thomas B. Reed, being heckled by a fellow member, with his sure-fire wit quickly subdued him and then, addressing the Speaker of the House, drawled: "And now having embalmed that fly in the liquid amber of my remarks, I will proceed."

Some lumps of amber are known which contain from twenty to thirty insects, both large and small. Kircher is said to have had a rosary with each bead enclosing a different kind of insect.



CHAPTER XII

1. At the present time, different nations prefer different types of amber.

2. When rubbed, most amber emits a pleasant odor, some a fetid odor. Marcus Cornelius Fronto,* referring to authors who repeat themselves, states that they "rub up one and the same thought oftener than girls their perfumed amber." He lived 100-167 A.D. Apparently Roman women possessed balls of amber which they rubbed for fragrance.

3. Thales (636-546 B.C.) knew of the electrical prop-

* Correspondence translated by C. R. Haunes, Loeb Classics, London, 1919, Vol. II, p. 105.

Notes

erties of amber, and prehistoric man doubtless discovered it. If the latter reference be true, it accounts, in addition to amber's beauty, for the high regard in which early man held amber. Plutarch (46-120 A.D.), in his *Platonic Questions*, has the following curious comment: "Neither amber nor the loadstone draws anything to it which is near, nor does anything spontaneously approach them . . . In amber there is a flammeous and spirituous nature and this by rubbing on the surface is emitted also by recluse passages and does the same that the loadstone does. It draws the lightest and driest of adjacent bodies, by reason of their tenuity and weakness; for it is not so strong nor so endued with weight and strength as to force much air and to act with violence and to have power over great bodies, as the magnet has."*

In his *Symposium*, the participants discuss why "amber draws all light things to it, except basil and such as are dipped in oil."*

4. Juvenal* tells of the value the tycoon Licinus placed upon a ball of amber and his fear that it might be stolen.

5. The Greek physician Asclepiades (about 80 B.C.) recommended amber pills for hemorrhage. Dioscorides,* in describing *lyncurium*, states that amber "is good for the stomach and for a belly that is troubled with the flux." Incidentally, he does not believe the lynx urine origin and says it is called by some "succinum pterygophoron" (because it draws feathers to it). Lapidaries in the Middle Ages extol the medicinal virtues of amber. Amber is used today in Lombardy and the Piedmont as a cure for goiter.* Amber necklaces are still sold in Mayfair, London, in the chemists' shops as a cure for croup, asthma, and whooping cough. Russian midwives wear amber chains, often ponderous, to protect themselves and their wards from illness. Prussian babes wear little amber beads to aid teething.

* Plutarch, Boston, 1838, pp. 436-7.

* op. cit. Vol. III, p. 252.

* *Satire XIV.*

* Englished by John Goodyer, 1655 A.D., edited by Robert T. Gunther, Oxford, 1934, p. 124.

* *Handbook of the Collection of Gems and Precious Stones in the U. S. Nat. Mus., U.S. Nat. Mus. Bull. 118, G. P. Merrill, Washington, 1922, p. 156.*



CHAPTER XIII

1. The properties of *lyncurium* strongly remind us of tourmaline. (For the lynx urine myth, see notes to Chapter XI.)



CHAPTER XV

1. *Adamas* is derived from the Greek word meaning "to subdue"; that is, "untamable" or "unconquerable." *Adamas* and the French *dame* are from a common root; so diamonds and women are linked even etymologically. Dana, in his *System of Mineralogy*, says that the ancients used the term for a number of minerals, including the diamond, quartz, hematite, emery, etc. I would be inclined to eliminate emery and add colorless sapphire, and perhaps other light-colored gems.

* *The Shield of Heracles.*

Adamas—as used by Hesiodus* (8th century B.C.); Pindarus (522-442 B.C.); the Greek tragedians (5th century B.C.); Aeschylus (525-456 B.C.), (for example mentions the adamantine chains by which Prometheus was bound); Apollonius Rhodius (246 B.C.); Catullus (87-47 B.C.); and Quintus Smyrnaeus (4th century A.D.)—refers to a hard weapon or a metal, usually an alloy of iron. Albius Tibullus (died 19 B.C.) had apparently never heard of *adamas* as a gem as he names gold and emeralds (*smaragdus*) as the most valuable of the earth's possessions.

The diamond probably did not reach Europe, and if so only Greece, before the 5th century B.C. and then, if at all, only as the rarest of curiosities. It is believed that the minute uncut colorless precious stones set as eyes in a dainty bronze statuette of a girl, dating from about 480 B.C. and now in the British Museum, are diamonds.* It is probably, however, that Theophrastus did not know India's gem. The diamond may have reached Egypt, a station on the Indian trade route in the 3rd century B.C., and Rome about 65 B.C. Uncut

* H. B. Walters, *Catalogue of Bronzes*, Brit. Mus., London, 1899, p. 17; also A. Monnickendam, *Secrets of the Diamond*, London, 1941, p. 9.

diamonds occur in a number of Roman rings of Imperial times, but most of these at least postdate Pliny's time. Our author mentions the smooth polish of the Indian stones. Natural crystals suitable for mounting uncut were called *naifes* by the Hindus who prized them highly. Garcia da Orta* says "The Canarese say that, as a virgin is more valuable than a woman who is not one, so the naife diamond is worth more than the cut one."

* *Colloquies on the Simples and Drugs of India*, first published 1563, translated by Sir Clement Markham, London, 1913, p. 345.

All references to the diamond in the Old Testament are open to question, as the translators of the King James version knew nothing of precious stones. The reference which best fits the gem occurs in Ezekiel 3:9; "an adamant harder than flint." The word so translated is *ut adamantem*, but I am informed that in the Vulgate version at this point there is no reference to any form of *adamas*. As we know it today, the Book of Ezekiel dates from the middle of the 5th century B.C.

Dionysius the Elder, Tyrant of Syracuse, boasted that he left to his son his dominions secured by "chains of adamant." Among the works frequently attributed to Plato (died 347 B.C.) is *Epistle I* addressed to Dionysius the Tyrant and in this occurs the passage "neither gold, diamond nor couches silver wrought" are as "rare as gallant men's unanimous resolve." Here the Greek word refers to a luxury and presumably a gem. Unfortunately, critics doubt that the letter was written by Plato and some consider it a forgery by an unknown and undated author.

Virgil (70-19 B.C.) describes the door posts of Avernus as of "solid adamant," evidently in this case iron, following Homer's description of the Gates of Tartarus, although Homer uses the Greek word equivalent to iron. Horace (65-8 B.C.) appears to have always used *adamas* as the equivalent of iron. Ovid (43 B.C.-17 A.D.) frequently mentions *adamas*, usually referring to a very hard and ironlike substance; the possible exception* is his statement that time "wears the hard flint and the adamas." Propertius (50-15 B.C.) usually uses *adamas* in the sense of steel, but he may refer to the gem in *Elegy III*.* Again Claudian (4th century A.D.) usually

* *Tristia*, Book IV, Elegy 6.

* IV, 3k.

A ROMAN BOOK ON PRECIOUS STONES

* line 139.

* *Knight's Tale*, line 1990.

† *Romaunt of the Rose*, line 1184.

* *Henry VI*, Act. I, Scene 4, line 52.

* Act II, Scene 1, line 195.
Also *Troilus and Cressida*, Act III, Scene 2, line 175.

* line 3.

* *History of Stones*, John Hill, translator, Ch. 32.

by *adamas* means "steel," but in the *Praises of Stilicho** may refer to the gem.

Chaucer (1340-1400 A.D.) considers *adamas* a superior iron* or a magnet,† and uses the form *dyomaunt* for the gem.

Shakespeare frequently mentions the gem, diamond. "Adamant" to him is either iron or a related substance* or a magnet, as in *A Midsummer Night's Dream*:* "You draw me, you hard-hearted adamant." When Milton (1608-1674) speaks of a man "armed with a Diamond," he evidently had a metallic weapon in mind. While Sir Francis Bacon (1561-1626 A.D.), when referring to the gem uses "diamond"; at the same time for other gems he uses older forms, "smaragd, achates and jaspes." On the other hand, in a letter to Sir Michael Hicckes (August 27, 1610), asking him to be his house guest, he adds: "If your son had continued at St. Julian's, it might have been an adamant to have drawn you." Samuel Johnson (1709-84), in his imitation of Juvenal's *Satire X** uses adamant in the sense of steel. Addison (1672-1719), in his poem dedicated to Sir Godfrey Kneller, refers to William III, king of England, as follows:

*"And mighty Mars, for war renowned,
In admantine armour frowned."*

2. As to gem prices, see Introductory Chapter 8.

3. Some classical reference to *adamas*, which apparently cannot be referred to iron or gold, besides that of Plato, Propertius, and Ovid mentioned above, follow.

Theophrastus* refers to *adamas* but once; in listing incombustible stones and after stating that the carbuncle was so named "from its not being injured by the Fire." He adds "for the Diamond (Hill's interpretation) might as properly be for the reason called by the same name, as it also possesses that quality." Mere incombustibility, within the limits known to the mineralogist of that day, is scarcely proof that Theophrastus knew our diamond. He fails to list it among the gems, and diamonds, if known in his day in Greece, must have been very rare.

I believe the earliest scientist to mention the diamond

Notes

is the Roman, Lucretius* (95-51 B.C.). He states, "Again, whatever seems to us hardened and close set must consist of elements more closely hooked and held, knit deeply together by branchlike shapes. Amongst the first in this class, diamond stones (Latin *adamantina Saxa*), for example, stand in the front rank, accustomed to stand blows." This sounds like a statement by a mineralogist of today, versed deeply in the structure of crystals. Further, note particularly the phrase "accustomed to stand blows," the precursor of Pliny's hammer and anvil myth. I am strongly inclined to believe that T. Lucretius Carus knew the diamond.

Augustus* (63 B.C.-14 A.D.) twits Maecenas on his love of gems including a "diamond of the upper regions (*adamas supernas*)."

In the same paragraph the pearl, emerald, jasper, beryl, and garnet are mentioned. It should, however, be remembered that Macrobius lived long after Augustus (indeed 395-423 A.D.). A reference probably to the diamond, and if so slightly antedating Pliny's description, is found in the astronomical poem* by Manilius who flourished in the 1st century of our era—"Sic *adamas punctum lapidis, pretiosior auro*"—"diamond a mere point of stone more precious than gold." Here we find two of the diamond's most striking characteristics emphasized—small size and great value. He, as a man of science, had probably seen and examined the diamond.

Seneca's words "*Nec sec dri adamas aut caedi vol deteri potest*" suggest strongly that the Romans were unacquainted with the cut diamond as we know it. Juvenal tells scandalous tales of the popularity of the diamond in his time, a generation or two after that of Pliny. Plutarch,* to all intents and purposes Juvenal's contemporary, refers to "the sparkling of emeralds and diamonds."

4. Plato (428-347 B.C.) says* "But the germ of gold extremely hard through its density and of a dark tint has been called *adamas*." The source of Pliny's *auri nodus* (germ of gold) is evident, although Plato is not among those Pliny cites as authorities for Book XXXVII. Commentors on Plato add this: *adamas* was

* *De Rerum Natura*, as translated by W.H.D. Rouse, Loeb Classical Library, Book II, lines 444-8.

* *Macrob.* II, 4.

* *Astronomicon* IV, 926.

* Wm. W. Goodwin, *Miscellaneous and Essays*, Boston, 1888, Book II, pp. 495-6.

* *Timaeus*, Ch. 59.

the noblest and purest part of the metal condensed into a transparent mass. The description, while fragmentary, is not out of line except for color. I have already expressed my doubt that Plato knew the diamond. Pollux (later part of the 2nd century A.D.) on the other hand applied the name *adamas* to grains of placer gold. A modified form of Plato's conclusion is revived by the 14th century plagiarist, Sir John Mandeville,* "and Men find many times hard Diamonds in a Mass that cometh out of gold, when Men purify it and refine it out of the Mine: when Men break that Mass in small Pieces, and sometimes it happens that Men find some as great as Peas and some less, and they be as hard as those of Ind." A still later reference is that of Jeane de la Taille (1540-1608) in a poem addressed to Marguerite de Valois.* He describes a diamond which came "from gold and from the sun."

* *Voyages and Trans.*,
edited by Arthur
Layard, New York,
1899, p. 98.

* *Le blason de la
Marguerite*, Paris,
1574.

There are several variants or at least related forms of Plato's theme, namely, the Chinese belief expressed in the 3rd century of our era that diamonds are the rulers in the midst of gold, that colorless sapphire boiled in molten gold is transformed into a diamond, a belief also expressed by Cardanas in 1585 and an extraordinary variant of the antimagnetic qualities of gold later to be commented upon. Among the Arabs, Pseudo-Aristotle (prior to 850 A.D.) states that "the diamond pounces on placer gold grains until their union is accomplished." Both Mohammed Ben Mansur (12th century) and Qezwihi (1208-83 A.D.) state that the diamond clings to gold (see below).

5. As to the occurrence of diamond in metal mines, Pliny certainly refers at least largely to placer mines and from the text apparently confines his remarks to such mines. Gold and the diamond are each notably resistant to both attrition and chemical solution. In consequence, diamonds occur in some gold placers, and gold is a satellite in practically every diamond placer. The association in nature of gold and diamonds was known to the Chinese in the Chin Dynasty (265-419 A.D.).* (See also Mohammed Ben Mansur and Qezwihi above.)

* B. Laufer, *The Diamond, etc.* Field
Museum, Chicago,
1915, pp. 35-6.

Notes

6. Pliny's description of the crystal form of the Indian diamond is accurate* as is his statement of the natural smoothness of some of the crystal faces, equivalent to a man-made polish.

7. Pliny's statement that the largest Indian diamonds then known were the size of a hazelnut suggests a five to ten carat stone.

In Roman literature there are few references to large diamonds and there is no evidence that today we would consider any of them large. When in 33 B.C. Marc Antony solemnized the coronation of Cleopatra and her children, he is said to have worn a purple robe embroidered with gold and fastened with diamond buttons.* I have not found the original reference but William Jones' statements are dependable. Agrippa, the last king of the Jews, (30-100 A.D.) is said to have given his sister Berenice, with whom he had incestuous relations, a large (at least for that time) diamond set in a ring. This creature appears also to have been the mistress of Titus (about 79-81 A.D.). Juvenal,* in describing the visit of a woman, temporarily in the favor of a rich Roman, to a fashionable jewelry shop of the time, mentions this stone:

*"One gem is there whose scintillating light,
Too strong temptation! Captivates her sight.
The same (they tell her) the authentic stone,
That once on Berenice's finger shone,
The pledge which on a guilty sister's hand
Agrippa placed."*

The passage is interesting inasmuch as it is the first reference, so far as my knowledge goes of the fact, that fine gems—provided they have history back of them—are more valuable than newly mined gems of the same size and quality, i.e., the historical factor in valuation.

Nerva, who died in 98 A.D., gave, according to Aelius Spartianus,* a diamond to Trajan—presumably unmounted and said to have been large—as an indication that the latter was his designate as emperor. He adds that Trajan, in turn, handed it on to Hadrian in recognition of his eminent services as commander of the First Legion in the second Dacian War, thereby acknowl-

* See *Pliny as a Mineralogist*, Intro. Ch. 3.

* Wm. Jones, *Crowns and Coronations*, London, 1883, p. 333.

* *Satire VI*, lines 195-200.

* *Scriptores Historiae Augustae*.

* Dio III, 30.

* *Pirotechnia*, English translation by C. S. Smith and M. T. Gnudi, A.I.M.E., New York, 1943, p. 122.

* *Travels in India*, translated by V. Ball, London, 1925, Vol. II, p. 57.

* *Memoirs of Sultan Babir*, entry May 4, 1526.

* *A Memoir on the Diamond*, London, 1839, p. 53.

edging him as his successor, a precedent Augustus had established in giving his signet to Agrippa.*

According to the Italian metallurgist Vannoccio Biringuccio,* early in the 15th century the two largest diamonds known were, one "in the possession of Solomon, emperor of the Turks," in size a bit less than "a half walnut," and another slightly smaller which "His Holiness (Nicolas) had in the folds of his papal mantle."

Jean Baptiste Tavernier* states that prior to the time when the Indian mine of Coulour was opened toward the middle of the 16th century, the largest diamonds weighed ten to twelve carats. While at that time few large stones were known, we have unimpeachable historical proof that the Kohinoor* was known at least in the first years of the 14th century, if not long previously, and it is likely that the Sancy and probably the Florentine diamond, which later Tavernier himself examined, were in Europe late in the 15th century. In 1559, Philip II of Spain purchased the Antwerp diamond from an Antwerp diamond merchant so that this stone probably was found in some Indian diamond field before the Coulour field was discovered. Thanks to Tavernier, however, we know of many large diamonds found in the 17th century and in the 18th and 19th centuries, due respectively to the discovery of the Brazilian and South African fields, the number of large stones known increased rapidly. Of the diamond fields of the world, Indian and South African are par excellence the source of large diamonds. The Bagagem district in Brazil stands out among Brazilian fields as a producer of large stones and in 1943 Sierra Leone was added to the select group.

John Murray* says that it "has been stated that the number of diamonds of the weight of 36 carats and above does not really amount to more than 19": also probably an understatement, but indicating the rarity of large stones until the South African fields were discovered. The American should not be contemptuous of the small size of the diamonds known to Pliny for a writer in *Harper's Magazine*, February, 1866, says

Notes

"It is doubtful whether there is any diamond in the United States of more than 12 carats in weight."

8. That only the *adamas* of India (where the diamond is still mined on a small scale) and that of Arabia (not a source; probably an intermediate trade station from India to Rome) were our diamond is indicated by Pliny's statement that these varieties alone outranked the pearl in value. Further, they alone survive the anvil test. The Abbot Marbodius, when master of the Cathedral School of Anjou (1067-81 A.D.), wrote his famous *Lapidarium*. His principal sources were Pliny, Solinus, and Pseudo-Orpheus. He states the Arabian *adamas* of his time is less "obdurate" and "less in price" than the Indian: hence presumably rock crystal. Pliny's description, however, indicates strongly that the Arabian *adamas* of his day was the diamond.

In Pliny's time, India was the sole source of diamonds. These fields were probably discovered from 800-600 B.C.* and stones probably reached Europe as early as the 5th century B.C. Dionysius Periegetes (a native of Charax in Susiana, who lived probably in the time of Augustus or at latest that of Hadrian, i.e., probably near the end of the 1st century A.D.) knew of the alluvial origin of India's diamonds. In Pliny's time, diamonds were exported from India via the city, Bacare (modern Parakad, 9° 22' N. 76° 22' E.), and Nelcynda (on Cochin coast, about 9° 58' N. 76° 14' E.).

Athenaeus* (end of 2nd and beginning of 3rd century A.D.) states that Indians brought pearls and diamonds to Ptolemy Philadelphus (309-246 B.C.). The poet Theocritus (316-250 B.C.), while of Philadelphus' court, in the three instances where he uses "adamant," refers, however, in each to steel or some other hard metal.

Ptolemy, the Alexandrian, in his geography written 150 A.D., mentions several diamond fields in India. Dr. Valentine Ball* identifies Ptolemy's Sambalaka with Tavernier's Soumelpour (Bengal), his Manada with the Mahanadi, and his Adamas River with one of the other rivers rising in Chota Nagpur.

Pliny states that at one time Aethiopia (our Egypt)

* Sydney H. Ball, *Hist. Notes on Gem Mining, Ec. Geol.*, 1931, Vol. XXVI, p. 709.

* *Periplus of the Erythraean Sea*, W. H. Schoff, New York, 1912, p. 45.

* Lib. V.

* Jean Baptiste Tavernier, *Travels in India*, translated by V. Ball, London, 1925, Vol. II, p. 355.

was a source. At times India and Aethiopia, particularly in the Dark and Middle Ages, have been confused. However, as the island of Meroe is mentioned by Pliny, such confusion is unlikely in this instance. Aethiopia was presumably a station on the trade route from India to Rome. From the shape Pliny gives this one of his species, it appears to have been a lasque.

* 1596 A.D., p. 458.

* *A Description of the East, Pinkerton's Travels*, London, 1745, Vol. X, p. 589.

* *Travels in Greece, 1743-4; The Modern Traveller*, London, 1776, Vol. I, p. 208.

* Frederick Elworthy, *The Evil Eye*, p. 444.

Morysons in his *Itinerary** states, regarding the rock crystal of Cyprus, called "Diamonds of Baffa," and less commonly "Paphian diamonds," "they say that adamants are found here which skillful jewelers repute almost as precious as the Oriental." Richard Pococke* says, regarding the "Baffa diamond," that it "seems rather to exceed the Bristol and Kerry stones," both examples of rock crystal. Alexander Drummond* says that "pellucid stones" inferior to those of Scotland occur in Cyprus "the places wherein they are found are called Diamond Mines" and deceived by the name one "Muhassel tried to work them to his heavy financial loss."

Siderites is evidently an iron ore, probably magnetite. Iron pyrite is locally known as "Pennsylvania diamond" in that state. It is stated that lithomancy is "divination with a precious stone called siderites."*

9. If, as I believe, Lucretius a century and a half before Pliny's time knew the diamond, he is the first known to me to begin the infrangibility myth, for he states that the diamond is accustomed "to despise blows." As a strange coincidence, and I believe that is all it can be, the diamond is mentioned in Ezekiel 28:13. Murray, in 1880, stated that Dr. Geddes was not satisfied with the translation, adding that the word in the text implied "a maul or hammer or what may be broken with it." The book as we know it probably dates from the middle of the 5th century B.C. In the anvil story, Pliny goes further, confusing hardness and infrangibility. Knowing that the diamond has the first quality, he jumps to the conclusion that it has the second. Later, however, he adds that sometimes by good fortune the diamond is splintered. It will be noted, however, that he refers only to the Indian and Arabian *adamas* which

Notes

alone, with the possible exception of *cenchros* and *chalazias*, we consider the diamond.

Physiologus, at the latest 500 A.D.* says the diamond cannot be broken with iron. Early Hindus shared the belief that a diamond struck by iron hammers would not break, as did the Chinese as early as the 4th century of our era. The Talmud repeats the same myth regarding what is translated "white sapphire" although it may in reality be the diamond. Ben Mansur, the great Arab mineralogist of the 13th century, states that if a diamond on an anvil were struck a mighty blow with a hammer the unbroken gem would bury itself in the anvil. Other adherents of the myth were Solinus, Albertus, Cyprian, Gerard Legh,* and the common people at least even to our day. Camillus Leonardus* was the first to refute the myth since he had seen diamonds crushed by a hammer. Garcia da Orta (1563), long a resident in India, also tells us that the diamond could be pulverized by a small hammer or pounded to dust by an iron pestle in a mortar. Sir Thomas Brown* states that as for breaking hammers, diamonds "submit unto pistillation and resist not an ordinary Pestle."

When, however, Pizarro's forces were dividing the booty of Coaque, the emeralds were tested by placing them on an anvil and hitting them with a hammer. Certain knowing conquistadores, however, collected the fragments as their own and among them Fra Reginaldo, a Dominican.* Dr. George F. Kunz† says that a fine black diamond found some eighty years ago on Todd's Branch, Mecklenburg Co., N. C., was "tested" with a hammer with the invariably disastrous result. The Goyaz diamond, found in the southeastern part of the state of that name, Brazil, in 1906, is supposed to have weighed in the rough some 600 carats. The "hammer test" was applied with the result that but 100 carats remained and the largest stone cut from it was a brilliant of but eight carats.

10. Solinus (about 250 A.D.), as to the hardness of diamond, states that the sapphire can be cut and engraved by it "*scribitur et figuratur*."

The diamond is still by all odds the hardest sub-

* *Life of Apollonius from Tyana.*

* *Accidens of Armone*, 1562.

* *The Mirror of Stones*, original 1542, English translation 1750, p. 62.

* *Enquiries into Vulgar and Common Errors*, London, 1686, p. 62.

* Pedro Pizarro, *Relation of the Discovery and Conquest of the Kingdom of Peru*, Cortes Society, New York, 1921, translated by P. A. Means, pp. 148-50.

† *Gems and Precious Stones of North America*, New York, 1890, p. 19.

stance, natural or artificial. If quartz in a scale of hardness is taken as seven and ruby as nine, the diamond is represented by the number forty-two. Pliny's statement that it is the hardest of substances was a keen scientific generalization. He had also a bit of luck, for in the 1900 years since he wrote, mineralogists have found no harder substance.*

* Ch. 76.

In Pliny's time diamond cutting was unknown, as is indicated by Seneca's statement. (See page 245.) The rudiments of the art were only introduced from India into Europe between the 8th and 13th centuries of our era. We forget how dependent for its beauty the diamond is on cutting. Isidore, Bishop of Seville, in the 7th century* describes the Indian diamond as *lapis parvis atque endecorus*, (a small stone lacking in beauty).

* Origines.

11. While the diamond is combustible, it was incombustible to methods known to the Romans for it burns in an atmosphere of oxygen at a temperature of about 770 C., carbon dioxide being produced. Ordinary heat does not affect it, diamonds in the great fire of Hamburg being uninjured. Theophrastus* long before Pliny's time stated that the *adamas*, like the ruby, was not injured by fire. That his *adamas* was our diamond is open to grave doubt.

* Art. 32.

Chau Ju-Kua* in his work on the Chinese and Arab trade in the 12th and 13th centuries states that the diamond from India "looks like fluorspar but which will not melt though exposed to the fire a hundred times. It can cut jade stone."

* *Chu-san-chi*, translated by Friedrich Hirth and W. W. Rockhill, St. Petersburg, 1911, p. 16.

12. The goat-blood-*adamas* myth is first recorded by Pliny, but this is not surprising since his *Natural History* is the first European work at least which more than casually mentions the *adamas*. It is evidently a gem dealer's tale and when Pliny recorded it, it could not have been old for the *adamas*, at the earliest, appeared in Europe some 550 years before Pliny's time and was still a mineralogic curiosity in his lifetime. Whether the myth is of Eastern or European origin we do not know although, as stated above, Pliny first records it. It is repeated by Pausanias* (174 A. D.).

* *Greek Travels*, Book VIII, Ch. 18, Art. 6.

Notes

The myth became widely distributed and persisted for centuries. In an early Chinese variant the animal is a savage goat called "Sing."

The Taoist, Ko Hung (4th century A.D.), says "The diamond when struck by an iron hammer is not damaged: the latter, on the contrary, will be spoiled. If, however, a blow is dealt at the diamond by means of a ram's horn, it will at once be dissolved and break like ice."* Isidore, Bishop of Seville (died 636 A.D.), states that it is the "fresh warm blood of stags" that softens the diamond. Note that in this version the goat is replaced by the stag.

Theophilus,* a monkish goldsmith in the 11th century, professes to use Pliny's method in cutting rare stones: "I procure urinam with the fresh blood of a lusty goat fed for a short time upon ivy, which being done, I cut the gems in the warm blood." To cut crystal he inserts it in a wound in the goat and permits it to be warmed in the blood; he can then cut what he pleases as "long as the heat lasts." The process is then repeated as the design requires. Like Pliny, he evidently considered *adamas*, or at least certain types of it, and crystal closely related. Albertus Magnus (1193-1280) added that the goat must first have drunk wine and eaten certain herbs, especially such as are believed to break the stone in the human bladder.

Vannoccio Biringuccio (1480-1539 A.D.), the great Italian metallurgist,* believed that goat's blood softened the diamond. Ludovicus Coronel,* Freige,† Hermolaus Babarus, Georgius Agricola, and Christopher Encelius* all believed the myth.

Grovovius (17th century), an early editor of Pliny, tried the diamond-goat's blood experiment, but to his great disappointment got no results.

A peculiar variant of Pliny's myth is given by Dr. V. Ball.* He, quoting Professor Blochmann,† says, according to a manuscript history of the Maharajas of Chota Nagpur, diamonds are tested for flaws by "fixing them on the horns of fighting rams."

Perhaps it is understandable that a variant arose in which the diamond could only be broken by the Blood

* Cited by B. Laufer, *The Diamond*, Field Museum, Chicago, 1915, pp. 21-2, also F. de Mely, *Les Lapidaires de L'Antiquité et du Moyen Age, China*, Paris, 1896, Tome I, pp. 124-5, *Pen ts'ao kang Mou by Li che tehen*, middle 16th century.
* *Schedula Diversarum Artium*, translated by R. Hendrie, 1847.

* *Pirotechnia*, translated by C. S. Smith and M. T. Gnudi, A.I. M. E., New York, 1943, p. 122.
* *Physics*, Paris, 1511.
† *Quaestiones physicae*, 1579.
* *De re metallica*, 1557.

* J. B. Tavernier, *Travels in India*, 2nd edition, London, 1925, Vol. II, p. 356.
† *Jr. As. Soc. Bengal*, Vol. XI, p. 113.

of the Lamb (Christ) at the mass. This form of the myth is found in the works of Cyprian, Austin, Isidore of Seville, and other church fathers and in the famous fraudulent letter of Prester John to the Emperor Manuel dated about 1165 A.D. It is the theme of an old Irish legend and the poet Frauenlob repeats it.

* *The Mirror of Stones*,
original text 1542
A.D., English trans-
lation, 1750, p. 63.
* *Opera Omnia*, Vol.
VI, p. 285.
* London, 1686, p. 62.

The first to ridicule the myth, so far as I know, was Camillus Leonardus;* shortly thereafter Garcia da Orta (1563) and Aldrovandi* (1599-1668). Sir Thomas Brown in *Enquiries into Vulgar and Common Errors** states that many people believe that diamond is softened by being steeped in goat's blood but that most of the best lapidaries "do not ascribe to this view."

13. Pliny is, so far as I know, the first to mention the industrial use of diamonds. Judging from the sharp edge of certain fine lines on Hellenistic and Roman engraved gems, the use of the diamond point in gem engraving began as early as the 2nd and 3rd centuries before Christ.

The oldest literary reference to the industrial use of diamonds is, however, to be found in Jeremiah 17:1. Jeremiah is believed to have lived about 626 to 586 B.C. We read in the King James version: "The sin of Judah is written with a pen of iron (and) with the point of a diamond: it is graven upon the table of their heart, and upon the horns of your altars." The use of the word "diamond" in the translation, however, is wholly unwarranted: the inset stone may well have been emery. There is no evidence that the Jews of that time knew the diamond.

14. Diamond becomes slightly electric if rubbed and attracts light objects. Provided this characteristic was observed by the ancients, its perversion might have accounted for the remarkable magnetic qualities ascribed wrongly to the gem by Pliny. Note that the French word for magnetite is *pierre d'aimant*, derived from Low Latin *petra de adamante*.

Pliny's myth that the loadstone becomes impotent in the presence of the diamond was repeated by many European writers from Marbodius (1067-81 A.D.) to Baccius (1587 A.D.).

Notes

Chaucer sings:

"Ryght as betwixt adamantes twoo
Of even weght, a pece of iren isette
Ne hath no myght to meve to no fro."

The Portuguese doctor, Garcia da Orta (1534-70), appears to have been the first to refute it.

The claim of Metrodorus of Scepsis that not only amber but also *adamas* was found in the German island of Baltia may well have grown from a distorted twist of the myth due to the electric properties of the two gemstones, or from Pliny's idea of antipathy of *adamas* and the loadstone. George F. Kunz* states that the Spaniards of the 13th century believed that the loadstone lost its magnetic property if steeped in onion or leek juice for three days. Magnetism was regained when the stone was bathed in goat's blood, a queer survival of Pliny's myth.

Vannoccio Biringuccio* similarly linked together strangely two of Pliny's myths regarding *adamas*, for he says that loadstones "lose their power and virtue every time that a rough diamond comes near them or when the lodestone and the thing it attracts are bathed in goat's milk or garlic juice or are greased with oil."

A variation of the diamond and loadstone myth is that of Giovanni Battista Porta, the Italian philosopher (1538-1615 A.D.) who stated that iron rubbed with a diamond behaved in the same way as if rubbed with a loadstone, that is, it developed what we call "polarity." William Gilbert, the Englishman (1544-1603 A.D.) who wrote *De Magnete*, tried to repeat Porta's experiment with seventy-five diamonds before a large audience "but never was it granted me to see the affect mentioned by Porta."

For centuries the diamond, among the Italians, has been the stone of reconciliation between man and wife but, so far as I know, Bartholomew Angelicus (13th century) was the originator. However, Camillus Leonardus (1502) names magnetite for this high office. Magnetite is supposed to be a potent love charm today among certain of our southern Negroes. In Pliny's myth the diamond nullifies the powers of the loadstone.

* *The Magic of Jewels and Charms*, Philadelphia, 1915, p. 65.

* *Pirotechnia*, 1st ed., 1540, translated by C. S. Smith and M. T. Gnudi, A.I.M.E., New York, 1943, pp. 116, 123.

Because of this conquest, has the diamond replaced magnetite in the reconciliation myth?

15. *Anachites* means "preventative of suicide," as it dispels unnecessary mental fears.



CHAPTER XVI

1. While the East largely received its emeralds from the West, the Greek *smaragdus* (more rarely *maragdos*) appears to come from the Sanskrit *marakata* or *marakta* (*Makara* is the sea) through the Persian *zabargat*.

* *Satire*, Book I,
Satire II.

2. In Horace's time* and in Pliny's also, diamonds being extremely rare and, in addition, not particularly attractive since they were uncut, the *smaragdus* and pearls held first place with many of the social leaders of the day. Plato (428-347 B.C.) in *The Phaedo* mentions *smaragdus*. Albius Tibullus (22 B.C.) apparently not knowing the diamond, leads one to infer in several of his poems that the emerald was the most valuable of all commodities. In his day emeralds were even used in horses' harnesses. In Claudian's time (4th century A.D.) helmets were ornamented with emeralds.* As Pliny points out, the emerald is equally effective in natural and artificial light.

* *The Praises of Stilicho*, Book II, lines 133-9.

Some authorities, illogically in view of the evidence, state that the ancients did not have the true emerald (grass green beryl) and that Europeans and Asiatics did not know the gem until after the discovery of South America. In refutation, the Egyptian emerald mines are very ancient. Classical intaglios occur fairly frequently on emerald, and Cellini tells us he used to resell emeralds bought of peasants who found them in the ruins of Rome. It is, of course, recognized, however, that the mines of Colombia produce the finest emeralds in the world.

The Emperor Marcus Aurelius Antoninus (121-180 A.D.) was evidently an admirer of the emerald. "That

Notes

which is really beautiful has no need of anything—Is such a thing as an emerald made worse than it was, if it is not praised?"* Claudian (4th century A.D.) mentions "emeralds bright" as gems suitable for men.*

3. To the Egyptians and Babylonians, to the Romans and Greeks, to the Hindus and to the people of Europe even to our own day, precious stones had, and have, valuable medicinal virtues. One of the earliest virtues reported was the beneficial effect of gems on the eyesight. From the Ebers papyrus, dating from about 1600 B.C., we find the Egyptians of that time made an excellent eyesalve from lapis lazuli: and Dioscorides agreed that lapis lazuli was good against soreness of the eyes. Marbodius (1067-81 A.D.) also praised its virtues as an eye strengthener. We find Theophrastus, more than 350 years before Pliny, saying that the emerald "was good for the eyes" and Pliny himself lauds its qualities; it relaxes even the strained eyes of the gem engraver. Isidore, Bishop of Seville (630 A.D.), Marbodius (1067-81), and several writers of the 16th and 17th centuries make similar statements. Shakespeare, in the *Lover's Complaint** sings:

*"The deep-green emerald in whose fresh regard
Weak sights their sickly radiance do amend."*

The Persians today add their praise. Pliny, quoting Callistratus, also states that amber is good for the eyes—a belief prevalent in Scotland and Italy and, until a short time ago, in England. He also considers hematite beneficial, in which belief he is supported by Galin, Marbodius, and Camillus Leonardus (1502).

It was natural to ascribe the virtues of the emerald to the closely related beryl, as did authorities from the 13th and 16th centuries of our era. Pliny's *smaragdus* included some species of turquoise and we find that many European writers on precious stones from Dioscorides to Nicols (1665) state that turquoise is also good for the eyesight. Further, Tiefeschi (born 1253 A.D.), Mohammed Ben Mansur (1300 A.D.), and other oriental mineralogists—as well as the Afghans and Egyptians of today—all support the myth. Other green stones at one time and another (largely,

* *The Thoughts of the Emperor Marcus Aurelius Antoninus*, Translated by George Long, New York, Book IV, Art. 20: also Book VII, Art. 15.
* *Pan. of 6th Consulship of Honorius*.

* Lines 213-4.

however, in the 16th or 17th centuries) which were believed to help the eyes were jasper, prase and chryso-prase, olivine, and jade (last Chinese).

Marbodius ascribed this virtue to the sapphire and was followed by a large number of authorities dating from the 13th to 17th centuries. Richard de Preston, grocer, in 1391 dedicated a sapphire in Old Saint Paul's, London, and it was used to cure diseases of the eye till the Reformation. Charles V of France (1364-80) possessed a sapphire with which he "touched eyes."

In the good old days of James I, an eye remedy, a sympathetic powder, was in vogue. A friar apparently brought it from the East in the 17th century. It was merely copper sulphate or blue vitriol, still occasionally used to treat trachoma.

I think we can agree that green or blue objects might rest the eye but Tiefeschi ascribes the same virtue to jet: others (13th to 17th centuries) to opal; to onyx; to pyrite; to agate;* to bloodstone;† and even to the ruby and spinel.

Men in New York wore earrings to strengthen their eyesight as late as 1865: British sailors did so up to the beginning of this century, and the mountaineers of our own Virginia up to a decade ago. The earliest reference to the belief is by the great Italian traveler to the Orient, Pietro dello Valle, who wrote in 1623-4 that diseases of the eye would be cured provided one wore an earring in the left ear.

4. Plutarch* tells us, however, that when Lucullus (about 85 B.C.) was sent as an ambassador to King Ptolemy Physcon to demand a fleet to aid Rome against King Mithridates, his mission was a failure. He refused all gifts until, on his departure, the king asked him to accept an emerald "of the precious kind." At first Lucullus refused it, but when the king pointed out that his portrait was on it, the Roman felt bound to accept the emerald. Lucan* states many emeralds adorned Cleopatra's palace.

5. "Nero viewed gladiator's fight with emerald." The meaning is obscure and is variously interpreted as follows: the emerald having, first been used as a mirror

* *The Byzantine Psel-lus.*

† *Orpheus.*

* See notes on Ch. 4.

* *Pharsalia*, Book X, 119.

Notes

to see what was going on behind him; second, that he saw the field reflected in it and; third, that being nearsighted he used it as a lens. From his portraits we know that Nero must have been nearsighted. Large emerald facets, held so as to reflect the light, act like mirrors. Indeed, Bishop Epiphanius (wrote 392-4 A.D.) says "it reflects like a mirror" and Mohammed Ben Mansur says it "reflects whatever is held before it like polished steel." That, moreover, the emerald may be used advantageously as a mirror is shown by the tale of Emperor Maximilian II. He was presented with a gold cup full of ducats while on a visit to Ratisbon. By reflection in the emerald of his finger ring, he detected one of his courtiers making away with his ducats, leading to the former's summary punishment. C. W. King* recognizing that Nero was nearsighted, adds that Nero saw the gladiatorial contests through an emerald, hollowed out at the back, serving as a concave lens. Whether distant objects could be seen through such a substance is open to question.

* *Nat. Hist. of Precious Stones*, London, 1867, p. 292.



CHAPTER XVII

1. The large number of "species" of the *smaragdus* is due to the fact that in Roman times the term was a catchall for most green gemstones.

2. The Scythian *smaragdus* was probably the green sapphire judging from its being the finest variety, its excessive hardness, and its freedom from flaws. Indeed, experienced jewelers always carefully test an emerald that is a deep green beryl and is flawless, fearing it to be a false stone.

Martial* said regarding Trajan's gift to the Temple of Jupiter "Jupiter wonders at the Scythian radiance of the emeralds." Again, "See how the gold begemmed with Scythian emeralds glistens. How many fingers does this cup deprive of jewels."*

* Book XII, Ep. 15.

* Book XIV, Ep. 109.

3. The Etesian wind tale stems from Theophrastus.

4. The emerald in classical times was one of the few gemstones which was exported from the West to India, counter to the normal direction of the gem trade of the time. The stones came at least largely from the Egyptian mines and whether the Tyrolese emerald deposits were discovered by Pliny's time is not known.*

Pliny apparently gives two Egyptian localities for *smaragdus*; one near Coptos (which is twenty-five miles northeast of Thebes), the other a considerable distance from that city. The latter is the well-known locality on the Red Sea shore (Jebel Sikait and Jebel Zebara): the other occurrence is only doubtfully known to us.

In recent times, emerald occurrences have been reported, rightly or wrongly I do not know, west of the Nile in Egypt in the Oasis of Siwahi:* likewise in Southern Algeria near the lost city of Tokalet.*

Emerald and beryl appear first commonly in the jewelry of rich Egyptians in the 12th Dynasty (about 2000-1788 B.C.) but C. M. Firth* found at Dakka on the Nile beryl beads in several predynastic graves. The Egyptian beryl and emerald mines are known to have been worked in the time of Sesortosis II (12th Dynasty about 1925 B.C.) the earliest tools to which a certain time can be ascribed being of his reign. The gems were obtained from two groups of mines from ten to fourteen miles apart, situated a little south of 25 degrees north latitude and some fifteen miles west of the Red Sea. The larger group is Jebel Sikait and the smaller Jebel Zebara. There were ancient workings likewise at Wadi Nugrus and Um Kabu in the same general region.* The precious stones occur in quartz veins or lenses in micaceous and talcose schists or in the contorted schist itself. As is frequent with the occurrences of emerald, a basic igneous rock, in this case serpentine, occurs in the general vicinity. Beryls are more common than emeralds and the gems are rarely of good quality, most of them being cloudy and of rather light color. Nevertheless this was the principal course of emeralds in ancient and medieval times in the Eastern Hemisphere.

* See Introductory Chapter 6.

* Bayle St. John, *Adventures in the Libyan Desert, etc.*, New York, 1847, p. 206; G. E. Simpson, *The Heart of Libya*, London, 1929, pp. 173-4.

* B. K. De Prorok, *Mysterious Sahara*, Chicago, 1929, p. 332.

* *Arch. Sur. of Nubia Report for 1909-10.*

* W. F. Hume, *Prel. Rep't. on the Geol. of the Eastern Desert*, Cairo, 1907, p. 59-62.

Notes

The ancient Egyptians sunk hundreds of shafts, and certain of the workings are said to be 800 feet under cover and sufficiently large to permit 400 men to work at a time therein. When G. Belzoni* visited the mines in the second decade of the 19th century, he found some fifty miners opening up the old workings, without, however, much success. He states that the ancient shafts inclined in all directions, and that the extensive workings "had been carried to a great distance into the bowels of the mountain till they found the emeralds."

D. A. MacAlister* reports that the underground workings are long and tortuous passages, just large enough for one man to worm his way through; in places, however, the whole seam was stoped. Probably most of the openings were kept narrow so as to obviate as far as possible the use of timber, but such timber as was used in the ancient workings is, in instances, still in good condition. The large Jebel Sikait shafts form seven or eight groups within a couple of hours' journey of one another. At Jebel Sikait and at Jebel Zebara, considerable towns sprung up with temples and houses for the miners; these were located on sufficiently high ground to escape possible destruction by floods. At Sikait are a few Greek inscriptions. Elsewhere, according to MacAlister, are tombs, watch towers, and villages dating evidently from their construction over a long period and probably built by different people. Some are small, primitive huts, others well built, commodious houses.

Apparently the mines were worked intermittently; undoubtedly Egyptian miners were first used. Of this we have an interesting suggestion in the *Instructions of Ptah-Hotep** which literally translated reads "the good word hides itself more than the emerald being found by female slaves."* In Alexander the Great's time, Greek miners were employed. It will be remembered that the figure of Ammon in his temple in the Oasis of Siwahi was, when visited by Alexander the Great, richly decorated with emeralds. According to the Greek, Pseudo-Callisthenes, Queen Candace is reported

* *Narrative of the operations and Recent Discoveries in Egypt and Nubia*, pp. 314-5.

* *Roy. Geog. Mag.*, 1900, Vol. XVI, pp. 544-7.

* First committed to papyrus about 2500 B.C., though Ptah-Hotep lived about 3500 B.C.

* *Records of the Past*, New Series, edited by A. H. Sayce, London, 1890, Vol. III, pp. 17-8.

to have presented the great Greek warrior king a crown set with emeralds.

Lucan states that the ornamental turtles on the doors of the palace in which Cleopatra entertained Julius Caesar were set with emeralds. Cleopatra was accustomed to confer on her favorites, emeralds engraved with her profile, and in her time the mines were known as "Cleopatra's mines." Her contemporary, Strabo, says the "Arabians" dug emerald "and other precious stones" out of "deep subterranean passages." In the vicinity of the emerald mines are old topaz mines, a probable explanation of his use of the phrase "other precious stones." Ptolemy, the geographer, mentions "Smaragdus Mons," evidently referring to Zebara.

Under Tiberius (14-37 A.D.) a metallarch was in charge of the emerald mines at Smaragdus and other Egyptian mines.* They were reported to have been worked under the Roman Emperor Claudius (41-54 A.D.) and the mountain was known as the Claudian Mountain.* The Arabs, according to their chroniclers, worked the mines in the 9th and 14th centuries, abandoning them in 1370 A.D. Abou-Zeyd Hassan, a merchant of Syraf, a port on the Persian Gulf, writing about 878 A.D., states that emeralds of Egyptian origin were exported from Syraf to India.

Mohammed Ben Mansur, in the 13th century, describes the emerald mines, and although Tavernier believed all emeralds were in his time obtained in America, his contemporary, Fryer, mentions the Egyptian mines. The exact location of the mines was unknown to Richard Pococke, the traveler of the middle of the 18th century. The French explorer, Cailliaud, rediscovered the mines in 1815, and under the patronage of Mehemet ali Pasha, he worked Zebara for a few years but without profit. He, however, presented the Khedive with some ten pounds of the gems. Sikait was reopened in 1899 and worked by an English company representing the jeweler E. W. Streeter. This venture was, however, not a financial success, the gems being of a poor quality.

The mines have produced some sizable stones, and

* Tenny Frank, *An. Econ. Sur. of Ancient Rome*, Baltimore, 1933, Vol. II, p. 242.

* Rappoport, *History of Greece*, Vol. XI, p. 49.

Notes

some old Egyptian beads are 15mm. in diameter. In the Middle Ages, under Arab supervision, a stone of twenty-two carats was found, but it was broken in extracting it. The well-known emerald of Julius II in the papal tiara came from these mines. It is of fine color, and in shape is hemispherical, being somewhat less than two inches in diameter.

5. Of the Cyprian *smaragdus*, Theophrastus* says it is used for "the soldering of gold, for it solders quite as well as the *chrysocolla* (malachite) and some even suspect both to be of the same nature, as they are certainly both exactly alike in color."

* *On Stones*, Ch. 23.



CHAPTER XVIII

1. Jan Huyghen von Linschoten,* regarding the true emerald (the grass green beryl), says "there is no perfect emerald because—none are clear and clean," as they always have "some fattiness within them like greene hearbs and such like." All gem experts agree. Linschoten was in India from 1582 to 1593.

* *Voyage of Linschoten to the East Indies*, Hakluyt Society, Vol. II, p. 154.

2. The *smaragdus* of Attica, found in its silver mines at Thoricos, is without doubt smithsonite, the carbonate of zinc. While other minerals fade in the sunlight I can, however, find no evidence that smithsonite in time loses its green color, as Pliny states. In the Chicago Museum of Natural History in Higinbotham Hall is a polished egg-shaped mass of smithsonite from Laurium, Greece. It is a fine lively robin's egg blue.



CHAPTER XIX

1. These huge *smaragdi* must have been glass, in the manufacture of which the Alexandrians among others were outstanding. Paste emeralds found in Roman

* *Epist.* 19, Morell translation.

* Ch. 45.
† Ch. 44.

* *Euterpe* II, Ch. 44.

ruins have in many instances been recut and sold as emeralds. Seneca* states that Democritus by a certain degree of heat "changed a pebble into an emerald: which art is made use of in coloring bricks and stones to this day."

Theophrastus* after saying that the emerald† is usually small, describes the Tani, which forms the huge pillar in the Temple of Hercules, Tyre, "But perhaps this is no true emerald but of the pseudo-smaragdus or bastard king: for there is such a stone of that class." The Greeks identified Baal of Tyre (Melgarth or Melkarth) with Hercules.

In describing these large emerald columns (more probably glass), Theophrastus is, in turn, quoting Herodotus who saw in the temple "two pillars, one of fine gold, the other of emerald stone, both shining exceedingly at night."* Some state that the immense emerald in the temple of Melkarth in Tyre fell from heaven.

Could Apion's giant "emerald" in the labyrinth of Egypt be the forerunner of the much later Arabic tale of a huge luminous garnet in the Great Pyramid of Gizeh? The Arabic tale states that when the pyramid was opened a thousand years ago, in one chamber was a man seated with a large luminous carbuncle on his forehead.

2. Here Pliny, following Theophrastus in describing a stone half jasper and half emerald—the first having not as yet been wholly transformed into the second by the earth's moisture—brings up the interesting subject of the "ripening" of a gem of little value into a fine one, a prevalent belief from classical times to the recent past. The Hindus and other Orientals had similar beliefs and the myth, although first recorded by Theophrastus, probably originated independently in Europe and Asia. Tied into the same theme is the "ripening" of a poor ore into a rich ore (lead ore slightly auriferous was enroute to become a rich gold ore per the alchemists) or the transmutation of a base into a precious metal. The last was the goal of alchemy, an accomplishment, however, only of modern chemistry. As to ore enrichment, the Malay tin miners

Notes

believe that tin ore becomes richer and better the older it grows.* To the Chinese tin miners in Siam, *galena* is immature cassiterite.

The myth was a natural outgrowth of the age-old belief that precious stones live, later supported by the idea that tropical heat was essential for the full development of the beauty of precious stones.

As to this belief in the ripening of gems, Thomas Nicols,* quoting Baccius, gives us the underlying principles: "Every gemm, saith he, hath a matrix formed out of some stone or other, in which matrix, by the distilling of a certain nutritive juice it is nourished, even as is the infant, sanguine materno, in the mother's womb."

Theophrastus* says that the emerald "seems to be produced from the jasper, for it is said there has been found in Cyprus a stone, the one half of which was emerald and the other jasper, as yet not changed." To the ancient gemologist, the deeply colored part of a jasper specimen might be taken for a *smaragdus*, the rest for jasper.

The South American chroniclers told the same story of the emerald long after Theophrastus' day. Garcilasso de la Vega* says that the finest emeralds are those of Puerto Viejo which "take their tincture from the nature of the Soil from whence they are produced, ripening there with time, like fruit in their proper seasons." At first the stone is all white, then one end "which points towards the east" becomes green: then all the stone. And as it comes "from the Quarry so it remains for ever after." Such stones, half green and half white, he had seen and he regrets that the unsightly part was cut off the specimen thus destroying "proof that the emerald gradually comes to maturity." Father Joseph de Acosta,* a Jesuit who was in America from 1570 to 1587, adds that Peruvian emeralds "seeme by little and little to thicken and refine" and he has seen all gradations from white to green. Antonio de Herreras' version* follows: "by little and little congealing and refining themselves and of halfe white and halfe greene, they goe ripening and recovering their perfection."

* Sir. James C. Frazer, *The Golden Bough*, Part II, *The Taboo*, London, 1927, p. 407.

* *A Lapidary—The Hist. of Pretious Stones*, Cambridge, 1652, p. 59.

* Ch. 48.

* *The Royal Commentaries of Peru*, rendered into English by Sir Paul Rycaut, London, 1688, p. 341.

* *The Nat. and Moral History of the Indies*, edited by Clement R. Markham, Hakluyt Soc., 1880, pp. 224-6.

* His Majesty's Chief Chronicler of the Indies in 1601, *A Description of the West Indies: Purchase his Pilgrimes*, Vol. XIV, p. 513.

* Review of *Histoire des Joyaux et des Principales Richesses d'Orient et de l'Occident*, 1665, Phil. trans., 1667, Vol. II, pp. 429-36.

* *Le Mercure Indien ou le Trisor des Indes*, Paris, 1667, pp. 36-8.

* p. 118.

* op. cit. p. 357.

* Hakluyt, op. cit. p. 139.

Chappuzeau* states that "Emeralds grow in stones, just as Chrystals, forming a Vein, which they are by little and little refined and thickened: and that some of them are seen, half white and half green: others all white: and others all green and perfect."

P. D. Rosnel* believes in the ripening of both ruby and emerald. Regarding the latter, he evidently copies the South American chroniclers quoted above. He says: "If the ruby is taken too soon from its cradle, the mine, before it is seasoned by the sun, it remains pale." Similarly, "The emerald gains its greenness little by little, as the fruit on the tree matures." To him,* red coral is ripe; green and white, immature.

The Hindus have believed for centuries that the white sapphire is an unripe ruby which some day will mature. The Burmese gem miners hold that pale rubies, if buried in the earth, gradually change to a fine red, indeed to them the ruby is the fully ripened member of the corundum family. To the Ceylonese gem digger, flawed stones are overripe. Garcia da Orta,* who was in India from 1534 to 1570, informs us that the color of the ruby heightens as the stone ripens. Von Linschoten,* after stating that the ruby may be of various shades or red, white, or half red and half blue: "The cause whereof is because that in the rockies and hills where they grow their first colour is white and by force of the Sunne, are in time brought to their perfection and ripeness" as rubies but "wanting somewhat of their perfection and being digged out before that time they are of divers colours as I said before and how much paler they are and lesse red" than rubies, by that amount are they less valuable.

Cardanus (1540) cites a sapphire only part of which was blue, and the rest colorless as a gem in the process of ripening.

To the Hindu, rock crystal (*kacha*) is an unripe diamond and often forms the husk within which is a diamond kernel (*pakka*).

The jade miners of Burma have similar beliefs. The jadeite, in place in the jadeite-albite intrusive, often has a weathered film: where it occurs as boulders in a

Notes

Pleistocene conglomerate, the film has been eroded off; hence the miners call the latter type "mature."* The mining of the jade of an outcrop at Sarmamaw was abandoned as the jade, being superficially altered to a white substance, had not matured according to the Kachins.* The turquoise miners at Nishapur, Persia, say that a cherry ripens in a season but it takes a thousand years for the sun's rays to ripen a turquoise.

The peasants of the Urals, when they find precious stones as they work in the fields, bury the less deeply colored stones so that by ripening the color may be improved.

A Dutch attempt to open a gold mine in the Parang Mountains, Java, failed as "the marcassites were not fully ripened."*

Some seventy years ago, in the early days of the Vaal River diamond diggings, South Africa, "some diggers aver that the bantom (one of the diamond satellites) in course of time, if left undisturbed, becomes a diamond; in fact, that the bantom is a diamond in another form."* The conclusion was evidently based on the close association of the two, the bantom being often an indicator of rich ground.

The shore pebbles of Iona Island, Hebrides, "ripen to a green colour."* The *cocos de mina* (quartz geodes) when they explode, as it is claimed, are said by the natives of South America to be ripe.

* H. L. Chhibber, *The Mineral Resources of Burma*, London, 1934, p. 42.

*op. cit. p. 43.

* Capt. Betagh, *Harris Voyages*, 1720, p. 236.

* George Beet and T. L. Terpend, *The Romance and Reality of Vual Diamond Diggings*, Kimberley, 1917, p. 43.

* M. Martin Grant, *A Description of the Western Islands of Scotland. Pinkerton's Voyages*, 1716, Vol. III, p. 658.



CHAPTER XX

1. Pliny's inference that beryl and emerald are one and the same mineral species is not only keen but correct. In 1797 Hauy found that beryl and emerald had the same physical characteristics and at his suggestion L. N. Vaquelin proved, in 1786, the two identical chemically.

2. The Indian origin of the earliest examples of this gem is suggested by the Greek word *br'pullos* and the Latin *beryllus*, forms which Weber derives from the

Sanskrit *vaidurya*. The latter, in turn, appears to be of Dravidian origin. Isidore, Bishop of Seville (about 630 A.D.) recognized that the name *beryllus* came from India; that is, that it was of Sanskrit derivation.

* England, 1577 A.D.

In medieval Latin *berrilus* was applied not only to beryl, but also to crystal and to an eyeglass or to spectacles; hence, the German word for spectacles, *brille*. Thus, Harrison* says: "The Houses were often glazed with Berill." In the same century mirrors were called in England *berral glas*. This may well explain the statement that beryl globes were used in divination in the Middle Ages, for globes of beryl must have been rare in the Middle Ages and I do not know that any such are preserved in the museums. Nicola de Cusa, Bishop of Brixen, (died 1454) called one of his books *Beryllus* for, like the *beryllus*, "whoever looks through it sees things otherwise invisible to the naked eye."

* See note 4 under *Smaragdus*.

The Egyptians used beryl in predynastic times (3400 B.C.) and commonly in the 12th Dynasty (2000-1788 B.C.). The Jebel Sikait and Jebel Zebara mines, producing both emerald and beryl, were opened at least in the time of Sesortosis II (about 1925 B.C.).*

* Q. Curtius Rufus, *Hist. of Alexander the Great*, translated by J. W. McCrindle, 1893, p. 220. Q. C. Rufus lived in the first half of the 1st century A.D.
* Ch. 19.

3. It was probably one of the earliest gems found in India. When Alexander the Great defeated Sopythes (an Indian monarch whose capital was near the present Lahore) the latter presented his beryl-set scepter to the victor.* The great Indian astronomer, Varahamihira, who lived from 505 to 587 A.D., in his *Vribat-Sanhita** mentions, in southern India, "Avanti's beryl mines." The Coimbatore locality was doubtless the principal producer. Other Indian localities are Rajputana, Kashmir, and Upper Burma. The true emerald rarely, if at all, occurs in India, it being one of the stones which for some 2,000 years India has imported from Europe and the West.

* IX, 544.

Ptolemy, an Alexandrian who flourished about 150 A.D., mentions Punnata as the source of Indian beryl in his day. In the *Greek Anthology** there is a couplet:

"An Indian beryl erst great Tryphon's skill
has bent my stubborn nature to his will."

If, as was believed fifty years ago, the product of

Notes

Addaeus, an Alexandrian poet of the time of the early Ptolemies, it suggests that the relatively great hardness of the beryl was early recognized and that Egypt had the stone from India at an early date. There is some doubt, however, as to the author and his time. Tryphon was a famous gem engraver.

4. Our aquamarines derive their name from "the pure green of the sea." The ancients had some fine beryls, notably the fine aquamarine engraved with the portrait of Julia by Evodos, once in the treasury of St. Denis.

5. According to Dr. Frederick H. Pough, *aeroides* is locally used in America as a name for pale sky-blue aquamarine.

6. Emerald crystals in Egypt were in the same way merely polished and pierced by the Egyptian lapidaries from the 12th Dynasty (2000-1788 B.C.) on.

7. In 1910 a beryl was found in Minas Geraes, Brazil, nineteen by sixteen inches, weighing 243 pounds. Being transparent, it sold for more than 1,000 pounds.

8. The Romans were partial to beryls and Juvenal states that the poor fear nothing, even in those early days of social unrest, but that the plutocrat, Licinus, is all atremble for his statues, his beryl, his tortoise shell, and ivory. When his lover, Cynthia, reappeared to Propertius (50-15 B.C.) after her death,* the fire (of her cremation) had devoured the beryl that she generally wore on her finger. Tryphiodorus (6th century A.D.) has the eyes of the wooden horse of Troy of the "blood red amethyst" and the "beryl blue."

* Elegy VII, IV 7 K.

*"A double tinge of rolling splendours shed,
The eyes of azure stone suffered with the red."*



CHAPTER XXI

1. The Greek and Latin forms of the word were, according to Weigand, derived from the Sanskrit *upala*, a "precious stone." This suggests, but does not prove, that the first stones came from India.

2. Pliny's statement that India is the sole parent "of opal," thus "completing her glory as being the great producer of the most costly gems," is probably one of the observations on which the scientists of the Middle Ages grounded their conclusion that gems of fine quality and gold in quantity were nurtured by the direct rays of the tropical sun and were confined to the tropics. Dr. Stephen Bateman of Queen Elizabeth's time wrote: "This stone breedeth only in Inde and is deemed to have as many virtues as hiewes and colors."

* *A Bibliography of Indian Geology, etc.*
Calcutta, 1918, pp.
175-6.

* *Quarterly Journal of the Geological Mining and Metallurgical Society of India*, 1932,
Vol. III, pp. 157-8.

T. H. D. La Touche* mentions several Indian localities, but no source of fine opals in India was known to him. While white opal with play of color fills the gas cavities in the trap of the Khilchipur State, none can "be classed as a gem."* In 1943, however, it was reported that gem opal was being mined in Kashmir; so time may prove Pliny right in listing India as a source of gem opal.

If not known in Pliny's day, the Hungarian locality was discovered soon thereafter. Perhaps the gem dealers of the day did not disclose this locality near at hand, on the theory that it would lessen the price of the gem.*

* See Introductory
Chapter 6.

3. To complement Pliny's poetical description, we may quote that of an ancient Mexican pre-Spanish lapidary, the Nahuatl text as given by Father Sag-hun:* "and that which they call the hummingbird silex (stone of a thousand colors) is (in color) like an animal of that nature. It is tinted (painted) in a thousand colors, white, blue, clear, brilliant red, black with white spots, and the colors of the rainbow."

* Seler's translation.

4. Pliny here recounts a story then but two generations old, and the opal of Nonius apparently was in existence in his time.

Today an opal the size of a "hazelnut" would be small; those as big as one's hand are not unknown. An opal of the size of a hazelnut might today be worth from \$750 to \$1,000 instead of Pliny's \$80,000.

Considerable excitement was caused about 1760 by the report that Nonius' opal had been found in the ruins of Alexandria. Bought by the French Consul,

Notes

Lironcourt from his dragoman, Roboly, for a trifle, it was in 1763 in the possession of the Duke de Nivernois, French ambassador to England.* The stone, however, was not, as an opal, sufficiently fine to render the identification likely.

* *The Bee*, Edinburgh, 1793, Vol. XIII, p. 234.



CHAPTER XXII

1. Pliny states that the Indians counterfeit no other gem so well as the opal. The Romans must have been easily pleased with their false gems, or perhaps the finest of their opals did not approach our finer opals. Today most of us would hold that a satisfactory imitation of the opal does not exist; it is, to be sure, imitated by suddenly cooling hot glass, causing it to crack. The fraud is, however, readily detected.

2. *Paederos*, "lovely youth." Onomacritus (500 B.C., or more probably one of his disciples 800 years later) says regarding it: "The delicate color and tenderness of the opal reminds me of a loving and beautiful child." Cosmos, the Greek monk geographer, curiously enough, adds that in India the *pezeros* is found, "which the Scripture calls anthrax." The word is evidently a form of *paederos*. Cosmos presumably is copying from Pliny.



CHAPTER XXIII

1. Pliny, ironically, here refers to the importance of women as customers of the jeweler, as he also does in Chapter 12 of Book XXXIII. As Shakespeare puts it:

*"Dumb jewels often in their silent kind,
More than quick words, do move a woman's mind."**

* *Two Gentlemen from Verona*, Act. III, Scene I, line 89.

2. The name sardonyx is from the Greek meaning a fingernail.

* 110 D.

3. Plato (428-347 B.C.) mentions the sardonyx in his *Phaedo*.^{*} The stone first appeared in Rome under the Republic.

* XLVIII, 20-6.

* *Satire* XIII, 138, and
Satire VII, 145.

Martial^{*} (40-104 A.D.) speaks of the sardonyx as a "gem of great value." Juvenal^{*} mentions the importance of sardonyx as a material for signets. The Roman lawyers, to be successful, had to live extravagantly and he tells us that, to appear prosperous, lawyers even rented costly sardonyx rings. Claudian (4th century A.D.) describes a sardonyx desk.^{*}

* *Epigram* XLIV.

Some of the agates and sards cut by Roman engravers, while not always of the first class, were fine, perhaps on the average better than we have today. To which one of the following facts is this due: that sources now known formerly produced better materials; that the Romans had access to deposits now exhausted or unknown to us; or that the Romans were clever in artificially improving the beauty of the stone? The classical gem engravers first had fine sardonyxes shortly after Alexander the Great's conquest, suggesting that these better stones came from India.

A cameo in the Paris collection has as its subject the apotheosis of Tiberius. It was brought by Baldwin II from Byzantium and given to St. Louis, who placed it in the Sainte Chapelle. It is a sardonyx of five layers, is thirteen inches long and eleven inches broad, and is presumably an Indian sardonyx. The Carpegna cameo in the Vatican, sixteen by twelve inches, is slightly larger.

4. The famous agate locality of Ratnapura, India, was known to Ctesias (resident in Persia, 415-397 B.C.) and is still an important source of the quartz gems. The fine carnelians found in the ruins of cities in the northwestern part of the Indus Valley, dating from about 3500 B.C., perhaps suggest the discovery of this locality as having been made long before Ctesias' time. A Chinese ambassador in 609 A.D. brought agate goblets from India.^{*}

* L. Carrington Goodrich. *A Short Hist. of the Chinese People*, New York, 1943.

5. Pierced sardonyxes derived from Indian neck-

Notes

laces were frequently used for cameos; such are normally of Indian origin. The hole in the Black Prince's "ruby" (really a fine spinel) is believed to show that it was once worn on a necklace or as a bead by some eastern potentate.

6. The well-known Sanaa, Yemen, Arabia, locality is mentioned by the Arabian mineralogist, Tiefeschi (1253 A.D.). Slightly earlier, Al Hamdani (10th century) states that onyx was found near the ancient royal city, Zafari. The onyx of Havilah mentioned in Genesis,* written in its present form about 500 B.C., may be from this locality. The stones fill gas holes in the andesite and basalts of Mt. Nukum, lying to the east of Sanaa. At the latter town, the stones are now cut.* The famous cameo, the Coronation of Augustus, judging from the feeble color contrast of the layers, was cut from an Arabian rather than an Indian stone.

* 2:12.

* K. S. Twitchell,
Mining and Metallurgy, New York,
Jan. 1929.



CHAPTER XXIV

1. The word originally referred to stalactitic marble (alabaster); it was first applied to a quartz gemstone by Theophrastus.* He there describes the onyx, but not the sardonyx, although the later must have been known to him, as the Egyptians used it prior to 2980 B.C. and Myceneans 1400 years later (from 1600 to 1400 B.C.). Martial* (40-104 A.D.), in describing the luxury of Etruscan baths, states that "the dew onyx emits its dry rays." This, of course, is a reference to the marble variety.

* Ch. 57.

* Book VI, Ep. 42.

Other references to this variety follow: Callimachus (about 240 B.C.); Gaius Valerius Catullus (87-47 B.C.); and Propertius* (50-15 B.C.).

* *To Cynthia*.

2. According to Aristophanes,* among the idle men of Athens, Socrates lists sophists, soothsayers, doctors, weather prophets, and "lazy, long-haired, onyx-ring wearers."

* *The Clouds*, first produced in 423 B.C., line 33.

The Romans not only used onyx in jewelry, but also

carved it into drinking cups, toilet articles, and miniature busts. The Mantuan Vase, which at least at the end of the last century was preserved at Brunswick, Germany, was made from a single onyx. The vase was six and one-eighth inches high and two and one-eighth inches across. Carved in relief were various symbols of the worship of Demeter; hence it was a Greek work. The lid, handle, and base of the vase were of gold. A number of other ancient vases cut from onyx or agate dating from Roman time are preserved in European museums.

3. As stated in the notes on sardonyx, the Sanaa, Arabia, locality has long been known. Pliny's Arabian onyx, black, encircled by white, is a good description of eye agates common in Arabia.



CHAPTER XXV

1. Pliny's *carbunculus* was largely garnet, but doubtless also included ruby, spinel, (both spinel ruby and balas ruby) and perhaps other red gems. *Carbunculus* signifies "red-hot coal." Our word "ruby" (from the Latin, *ruber*, red) first appears in the form *rubinus* in the 13th century.* "Ruby" was first used in 1310. The Hebrew equivalent of *carbunculus* was *eqdach*, from the root to "light a fire."

The ruby was probably produced in Ceylon as early as 600-400 B.C., and India in Pliny's time may have produced a few poor rubies. The Burma mines were probably not known then, the earliest reference to them being in the Shan records of the 6th century A.D.*

Spinel may have come from Ceylon and perhaps from Badakhshan (Afghanistan). The later locality is described by Istakhri (951 A.D.) and other Arabian authorities of the 10th century. Being near the age-old lapis lazuli deposit, it may have been known much earlier.

* Thomas Cantimprantensis, *De Natura Rerum*.

* N. M. Penzer, *The Mineral Resources of Burma*.

Notes

The Indian (Rajputana) garnet locality was probably known prior to the Christian era. Tellery, at one time manager of the garnet works at Jaipur, believes that the Indian garnets described in ancient writings came from Rajputana.

Many other garnet localities were known to the Greeks and Romans.

2. *Apyroti* (incombustible) from its resistance to fire, is doubtless our ruby, as most garnets are fusible.

3. Pseudo-Aristotle (about 7th to 9th century A.D.) was the first to recognize that the ruby, sapphire, and yellow sapphire were a single mineral species. Marbodius* (11th century) describes red, yellow, and blue *hyacinthos* (sapphire). One cannot read that delightful *Le Mercure Indien** without realizing that to De Rosnel the three corundum gems were but differently colored forms of a single mineral. Dutens* states that the people of Pegu (Burma) called all these gems ruby, they having had a red, a blue, a purple, and violet ruby. Rome de Lisle in 1782 recognized that the ruby and sapphire were crystallographically similar and the Abbe Haüy in 1796 described ruby and sapphire as a single species, *tetesia* (or "perfection").

4. Strabo* states that among the precious stones found at the "base of the mountains" are "the Lychnites and the Carchedonius." He also adds* that from the country of the Garamantes "are brought the Carthaginian pebbles."

Petronius, a contemporary of Nero, in his *Satyricon** sang:

*"and the Punic stone
That flashes ruby flame, what is't to thee?
Save that thou revel in its purity."*

Pliny in Book V, Chapter 5, describes the Amantes, a nation of desert tribes seven days' journey southwest of the Troglodytae (inhabitants of the west coast of the Red Sea), "a people with whom our only intercourse is to procure the carbunculus, a precious stone brought from the interior of Africa."

When Cornelius Balbus was accorded a triumph about 40 B.C., he adds among the places enumerated

* *Lapidarium* XIV.

* Paris, 1667.

* M. L. Dutens, *Des Pierres Precieuses*, Paris, 1778, p. 39.

* Book XVII, Ch. 3, para. 11.

* Book XVII, Ch. 3, para. 18.

* J. M. Mitchell, London, 1922.

A ROMAN BOOK ON PRECIOUS STONES

as conquered by him Mount Gyri, the inscription stating that this was the source of the gems.

5. The almandine garnet, the deep red variety, derives its name from Pliny's *carbunculus alabandicus*. For Alabanda as a cutting center see Introductory Chapter 5.

6. The Babylonians (3000-2000 B.C.) believed that gemstones had personality; that they lived and suffered illnesses; also that the larger and more brilliant precious stones were "male" and that the less fine gems were "female." The Assyrians (about 700 B.C.) expressed the same opinion. Early Chinese books* state that jade is the most perfect development of the masculine principle in nature. Theophrastus, writing about 315 B.C., mentions male and female carnelian, *lyncurium*, and *cyanos*. The belief in sex in precious stones was held by the Romans, by the Magi (the ancient Persian priests), and by Europeans down to our day. To the Hindus, for centuries the best diamonds have been male. Other adherents are the present-day Arabians, Negro tribes on the upper Nile, and the people of the Caucasus. The Zuni Indians call the deep blue turquoise male, the off-color stones female.* The Navajo, similarly, considers the deep robin's egg blue turquoise the male and the common greenish turquoise the female.*

Pliny calls male the loadstone which attracts iron. To be gallant, we should add that the female antimony compound* is preferred to the male, being more bright, and smoother to the touch. Normally, Pliny, however, designates the more brilliant stones "male" (*sarda*, *carbunculus*, *sandastros*, *cyanos*, and *sapphiros*). There are two kinds of *diphyses*, the black male and the white female.

Later gemologists have been even less gallant than Pliny. As to the star stones or *astroites* (probably our star sapphire), Thomas Nicols* says the male is full of stars, while the female is full of things resembling canker worms and Palmer worms. Camillus Leonardus* states that the male lapis lazuli is "neater and purer

* Chou Dynasty, 1122-249 B. C.

* F. W. Hodges, *Leaflets of the Mus. of the Amer. Ind. Heye Foundation No. 2*, New York, 1921, p. 5.

* John Adair, *The Navajo and Pueblo Silversmiths*, Norman, Okla., 1944, p. 199.

* *stimmi*, Book XXXIII.

* *A Lapidary or the History of Pretious Stones*, Cambridge, 1652, p. 157.

* *The Mirror of Stones*, English translation, 1750, p. 93, original 1502.

Notes

than the female" and is beautified by "small golden dust" included therein.

7. The variety *syrtitae* so reflects the sun's rays that it is easily found. This may be a modified form of the myth that peridot on St. John's Island in the Red Sea, due to its luminescence, is found at night.

8. Almost a pint. Small cups are still cut from garnet, particularly from Indian stones.

9. Pliny's description of the male Carchedonian garnet suggests that he may have known the star garnet.

10. As to Theophrastus' statement that the *carbunculus* of Orchomenus was used as a mirror, John Evelyn saw in 1643 in the treasury of St. Denis near Paris "a mirror of a kind of stone said to have belonged to the poet Virgil."*

11. Massilia (our Marseilles).

12. Olisipo (our Lisbon).

13. The Emperor Tiberius (14-37 A.D.) is said to have owned a ring, a serpent with a garnet clasped in its mouth. He believed that this protected him from the dangers of thunder and lightning. Once he stood on the highest of the Seven Hills in a terrific thunderstorm shouting his defiance, with no ill effects.

In consequence, doubtless, Giovanni Battista Porta, writing in 1561 A.D., informs us that if one wears a garnet suspended from his neck, he need fear no thunderstorm.

* *The Diary*, edited by William Bray, London, p. 42.



CHAPTER XXVII

1. While *anthracitis* was doubtless largely garnet, some ruby was probably included in the term. Pliny's statement, that when thrown into the fire they become quenched and deadened, suggests the partial loss of color when ruby is heated. On the other hand, the terms may refer to the color changes attending the

A ROMAN BOOK ON PRECIOUS STONES

* Book XXXVI, Ch. 34.

partial fusion of garnets. Pliny* somewhat similarly says of jet that "the application of water ignites it, while that of oil quenches it."



CHAPTER XXVIII

1. The Indian origin of these gems is indicated by their names, derived from the Sanskrit *sandastra*.

2. It is understandable how the "stars" of aventurine quartz should be considered supernatural and hence be given a religious significance by the priests of the Mesopotamian Valley.

3. For "male" and "female" stones, see notes under *Carbunculus*.

4. The number of spangles aventurine quartz exhibits determines its value today.



CHAPTER XXIX

1. The name is derived from a "lighted lamp." Similarly, Parian marble was known as *lychnites*, because, according to Varro, "it was cut in the quarries by lamplight."* I wonder if Pliny is not wrong here, since the quarries of Mt. Marpesius were open cuts.* Middleton says that Parian marble was crystalline and that each crystal caught the light brightly; hence the name.

2. The Indian *lychnis* doubtless is our red tourmaline, which must have reached Roman lapidaries among shipments of rough gems from the East, just as it did those of Amsterdam in the 18th century. Tourmaline is said to have first been recognized by the Dutch in a shipment of Ceylonese uncut gems received

* Book XXXVI, Ch. 4.

* Strabo, Book X, and Dodwell, *Journey in Greece*, 1740, Vol. I, p. 501.

Notes

in 1703 and to have been called "ashdrawer" because it attracts light objects.* Lemery first showed it to the Royal Academy of Sciences in Paris in 1717. In the last quarter of the 18th century one of the names by which tourmaline was known in France was *aimant de Ceylon* (Ceylonese magnet).

One of the earlier variants of the luminous gem myth is given us by Lucian (flourished 2nd century). In his *De Syria Dia* he says the goddess wore on her head "a lychnis (or lamp stone), a name derived from its nature. From it a great and shining light is diffused in the nighttime so that the whole temple is thereby lighted up, as though by many lamps burning. By day its lustre is more feeble; however, it still presents a very fiery appearance."*

* I.G.S. *Curiose speculationes bey schlaflosen nyhts* (Curious speculations during sleepless nights), Leipzig, 1707.

* Sydney H. Ball, *Luminous Gems, Mythical and Real*, *Scientific Monthly*, Dec., 1938, pp. 496-505.



CHAPTER XXX

1. Strabo* (about 65 B.C.-21 A.D.) says "at the base of the mountains (in Mauretania), precious stones are said to be found, as those called the lychnites and the carchedonius." (See notes under Chapter 25.)

2. The Chinese similarly believe that the diamonds of Shantung fall from heaven with the rains, and consequently they search only for the stones after heavy showers. The explanation, of course, is that the rains wash away some of the lighter constituents of the soil, disclosing the heavier minerals, diamonds among them, to view. The Chinamen's method of mining, if we can believe reports, is unique. After a rain he puts on his straw sandals and walks back and forth through the fields. The sharp points of the diamond penetrate the soles of the sandals and, when the days run warrants a cleanup, the sandals are piled up, fired, and the diamonds are then recovered by sieving the ashes.

3. The Turk, because of the unearthly beauty of the opal's play of colors, holds that it comes from no mine

* Book XVII, Ch. 3, p. 11.

on this globe, but falls from heaven with the lightning.

The crosslike twins of staurolite are highly prized by the peasants of Brittany as a sacred emblem. They aver that the crosses fall from heaven.

The Aztecs held that obsidian falls from the sky and the Yukis of California* believe that the obsidian blades used in certain of their religious ceremonies fall from the sky. Such blades are called *mit kichel*, or "sky obsidian." Certain Australian natives regard rock crystal or broken glass as fallen stars; hence, they are to be treasured as powerful agents of magic. The Indians of northwest Argentina state that hematite pebbles, prized by them, fall from heaven.

The Parsees of Persia believe that heaven has many precious stones; hell, but misshapen stones.

4. For explanation of this statement and additional myths and references to luminous stones as related by ancient writers, see note 4 under *Topazos*.

* A. L. Kroeler, *Bul.*
78, *Bur. of Am.*
Ethnol., Washington,
1925, pp. 193, 199.



CHAPTER XXXI

1. Pliny refers to it as a common stone. As to that from Paros, Solinus says it "is better than marble, but yet accounted as basest of all jewels."

2. While Pliny probably correctly derives its name from the City of Sardes (Lydia), one of its occurrences, the name may have been derived from the Persian word *sered* (yellow).

3. *Sarda* was well known to many authors antedating Pliny, among them Plato (428-347 B.C., in *The Phaedo*) and Theophrastus. Ctesias states that sard comes from the high mountains of India.

4. Pliny's statement that "among the ancients there was no precious stone more esteemed" is proved by the fact that in the British Museum collection of classical gems, 1300 out of 2600 are cut from sard and carnelian.*

* H. B. Walters, *Catalogue of the Engraved Gems and Cameos, Greek, Etruscan and Roman*, British Museum, London, 1926, pp. 15-16.

Notes

5. One of the earliest Roman intaglios known was that in a ring on the finger of L. Cornelius Scipio Barbatus, consul in 298 B.C. When he was disinterred, Pope Pius VI (1775-99 A.D.), then reigning, gave the ring to Dutens, the French archeologist. Later it was in the Northumberland collection in Alnwick Castle, England. On the sard was engraved a Winged Victory, standing and holding a palm branch.

6. This may be a reference to the artificial coloring of the chalcedonic varieties of quartz, in which oil might conceivably be used.



CHAPTER XXXII

1. In the time of Andreas Baccius, 1587 A.D.,* *topazos* still referred to the peridot.

2. This statement as to the fall in price of peridot is an early and interesting example of the factor or rarity in valuing precious stones.

3. Juba's account, as recounted by Pliny, varies in detail from those of Agatharchides, Diodorus Siculus, and Strabo.

Olivine or peridot was certainly not extensively, if at all, used in Egypt prior to the 18th Dynasty (1580-1350 B.C.). There still appear, from time to time, magnificent olivines from Egypt. Some are doubtless stones which have been hoarded by the Egyptians for years; others, newly mined, come from St. John's Island in the Red Sea.

In the 5th century (or possibly the 4th century) B.C., the book of Job was written. Regarding wisdom, it says: "The topaz of Ethiopia shall not equal it."* Here again I believe the translators have erred, transposing topaz for peridot. If so, the olivine of Africa (Red Sea) was known to literature a century or two before the time of Ptolemy Philadelphus, and perhaps earlier, as the Egyptians had some source of the gem in the 18th Dynasty.

Agatharchides (181-146 B.C.), tutor of Ptolemy Soter

* *Elpidiani Philosophi*, etc., Latinized by A. Wolfgangs, Cabelchovero, Francfort, 1603, pp. 44-7, original Rome, 1577.

* 28:19.

* *Diod.* III 39, pp.
81-82.

II, is the first to mention the exact locality of the gem deposit.* Strabo describes the gem mines of this island, although the translators call the gem topaz rather than olivine, as follows:

"The topaz (peridot) is a transparent stone sparkling with a golden luster, which, however, is not easily to be distinguished in the daytime on account of the brightness of the surrounding light, but at night the stones are visible to those who collect them. The collectors place a vessel over the spot where the topazes are seen as a mark and dig them up in the day. A body of men was appointed and maintained by the kings of Egypt to guard the place where these stones were found and to superintend the collection of them." At first, mining was impeded by the abundance of poisonous snakes; hence the early name of the islands, Ophiodes. Ptolemy Philadelphus, who lived in the 4th century B.C. (son of Berenice mentioned by Pliny) eradicated the pests so that mining could be continued.

Diodorus Siculus, writing in the 1st century before Christ, apparently obtained his data from Agatharchides. He states that the Egyptian kings forbade strangers to set foot on the island on pain of death and that, fearing theft of the gems, only provision boats were permitted to call at the island. The island was desert and the provision boats apparently were not overly regular in their calls; in consequence, the situation of the miners, according to Diodorus, was not a happy one. He repeats in substance Pliny's statement as to the method of mining, and one would infer from his writings that in his time hard rock mining was carried on. Ptolemy describes what is evidently the same island under the name of Agathon.

* Translation by W. H.
Schoff, London, 1912,
pp. 37, 167-8.

In the *Periplus of the Erythraean Sea*,* written in the 1st century of our era, one of the Roman exports to the Indian port of Barbaricum is *chrysolithos*, here doubtless meaning peridot rather than topaz. It was then an important Egyptian export. Strangely enough, emeralds are not mentioned. Did the Romans in those days pay better prices for this stone than the Hindus?

This island is the modern St. John's Island or Ze-

Notes

birget, thirty-five miles southeast of Ras Benas. *Zebirget* is the Arabic word for peridot. Lamps and vases indicate that mining was carried on during the Greek domination of Egypt, but positive evidence of earlier mining is lacking.* Later the mines were worked by the Arabs, and still later were visited by James Bruce in 1768 and Figari Bey in 1860. In 1900 H. A. the Khedive secured from the Egyptian Government a permit to examine the deposits. However, he did but little mining. F. W. Moore says the stones were dug from numerous pits sunk in peridotite detrital material. In the report of the *Mineral Industry of Egypt for 1922** the gems are said to be recovered from a stockwork of veinlets traversing the peridotite in all directions. At slight depths the fractures contract or become barren. This government report presumes the supply of fine material to be limited. The mines were leased for thirty years, beginning in 1906, by the Peridot and Egyptian Gems Co. but were shut down at the outbreak of World War I. The stones, some of deep yellowish green color and of sufficient size to weigh, when cut, twenty or thirty carats, were sent to France for cutting. The value of the yearly production of the mines from 1910 to 1914 averaged about \$54,000. The mines are now leased to the Red Sea Mining Company, but this corporation is apparently not working them.

Medieval Arab writers claim that both peridot and emerald occur in the vicinity of the town Esna on the Nile, latitude 25° 17' N. This may correspond more or less to Pliny's second locality.

4. Strabo's account brings up the subject of luminous gems, true as to some gems and as to others, one of the oldest of gem myths.

Vishnu, in his incarnation as Seshanaga under the name Ananta, had a thousand heads, in each of which there was a jewel that gave light.* Herodotus (484-420 B.C.) was the first European to describe luminous gems, the *smaragdus* columns of the Temple of Hercules at Tyre. Some wily priest probably put a lamp within the glass (?) columns.*

* See also M. de Roziere, *Scientific French Mission under Napoleon I and Teisachi*.

* pp. 25-6.

* *Vishnu Purana*, a Hindu work of, say 800-600 B.C.

* For details, see Sydney H. Ball, *Luminous Gems, Mythical and Real*, *Scientific Monthly*, Dec., 1938, pp. 496-505.

The account of Diodorus Siculus and Strabo is much more romantic than that of Pliny. A sparkling stone, peridot, they state, is not easily found in the day-time; however, its luminescence causes it to be easily found at night. As Diodorus expresses it, "the stone shines bright and glorious in the darkest night and discovers itself at a great distance. The Keepers of the Island disperse themselves into several Places to search for this stone and whenever it appears they mark the Place with a great Vessel of largeness sufficient to cover the sparkling stone, and then in the Daytime go to the place, cut out the Stone, and deliver it to those that are Artists in polishing of 'em." The tale probably is an Egyptian gem merchant's to enhance the value of his peridots.

A curious statement, probably a survival of Diodorus' tale, is found in the *Annals of the Han Dynasty*, written in the 5th century but based on the report of the Ambassador Kan Ying (97 A.D.). It is stated that Asia Minor or the Roman Empire produces "carbuncles and the precious stones that shine in the night."

In the *Physiologus*, written about 125 A.D., it is stated that the diamond is not to be found in the day but only at night. French authorities of the 13th century repeat the statement. Five hundred years later the jade of the rivers of Khotan, Chinese Turkestan, were discovered by its shining in the water at night; later, at low water, divers recover it.

5. Pliny mentions two islands on the Red Sea producing peridot (Topazos and Chitis). Some consider Chitis as the modern Mehun. Pliny, however, probably erred in mentioning two islands as sources.

6. The immense peridot consecrated to Arsinoe must have been glass. Pliny, when he mentioned the large size attained by peridot, evidently confused the gem with the glass imitation.

7. Peridot is a soft gem (hardness six and one-half to seven) and in consequence should be worn only in a brooch or other jewelry where it is protected against abrasion. It is too soft to be a satisfactory ring stone.



CHAPTER XXXIII

1. Turquoise was used in jewelry in Egypt and in the Mesopotamian Valley as early as 3400-3500 B.C. Probably the first turquoise came from the Sinai Peninsula.

Our word "turquoise" is derived from Turkey, through which country it passed centuries ago, en route from the Persian mines to Europe. The name "turquoise" first appeared in Europe early in the 13th century in *De Virtutibus Lapidum* by Arnoldus Saxo. The Dahae lived in the steppes to the east of the Caspian Sea. The great source of turquoise in the dark ages and probably earlier, Nishapur, Persia, lay south of these steppes. This suggests that these mines were known in Pliny's time, a not unwarranted assumption, for they were first mentioned by Amur-ul-Lais, ruler of Khorasan (878-903 A.D.), who, after being deposed, continued to live at Nishapur, adding in explanation: "Its stones are turquoises, its bushes, rhubarb, and its dust, edible clay. How could I leave such a land?" Ibnu'l Boitar (born in Spain, 1197) quotes Galenus (born 130 A.D.) as stating that in his day the best turquoise came from "Neisabur," Persia, whence it was exported to all parts of the world. It was used in Persian jewelry in the time of the Achaemenian king (600-550 B.C.).

2. As to Pliny's emphasis on the green color, the Persians preferred green to blue turquoise.

3. Isidore* (Bishop of Seville in the 7th century A.D.) says people of inner Asia to the north of Persia wore turquoise in their ears.

4. Pliny speaks of large turquoises. In the treasury of St. Mark's, Venice, there is (or was as late as 1927) a cup made of a single turquoise seven inches in diameter and three and one half inches deep.* The gallery at Florence has a turquoise as large as a small billiard ball with the head of Tiberius engraved on it.

5. The occurrence of turquoise, as given by Pliny as "an eye," is an apt simile, as anyone familiar with turquoise deposits would recognize.

* *De Rerum Natura*,
Book XVI, Ch. 17.

* *Harris Voyages*, London, 1748, also *Mission's Travels*, 1687 B, Vol. II, p. 540.

6. Is there any relation between Pliny's mounted miners and the fact that in the Middle Ages turquoise, if worn as an amulet, was supposed to keep the wearer from injury while on horseback? Van Helmont (1620) states that the wearer of a turquoise "may fall from any height; and the stone attracts to itself the whole force of the blow, so that it cracks, and the person is safe." Leonardus says: "it is useful to horsemen" and that "so long as the rider has it with him, his horse will never tire him and will preserve him unhurt from any accident." The jester of the Marquis of Villana, when asked by a knight, "What are the properties of the turquoise?" glibly replied: "Why, if you have a turquoise about you and should fall from the top of a tower and be dashed to pieces, the stone would not break."

The method of mining, as reported by Pliny, is without a doubt a gem dealer's tale. Theophrastus* states, regarding the cinnabar of Colchis, that it occurs on rocks and precipices "from which they get it down with darts and arrows." Long before, Herodotus* had stated that the spices, cinnamon, and cascia, were obtained by the aid of arrows loaded with lead from the nests of birds where they occur. Pliny adds that Indian cinnabar was shot down with arrows. It may also be worth noting in this connection that in former times arrowheads of turquoise were much prized by the Tibetans.* One of the early French explorers of America, LePage du Pratz, states that catlinite was shot down from inaccessible cliffs of the Missouri by the American Indian bowman.*

The tale of the Valley of Diamonds, familiar to you as one of Sinbad the Sailor's best, is Pliny's story of turquoise mining in reverse.

The original story, however, is told by St. Epiphanius, Bishop of Salamis, Cyprus, who lived from 315 to 402 A.D. Although a credulous, bigoted old churchman, he was a good executive, building many monasteries, and, besides, was a terror to heretics, composing a seven-volume treatise on heresies, eighty of which he tabulated. His work *On the Twelve Precious Stones*, an explanation of the High Priest's breastplate,

* Ch. 103.

* Book III.

* B. Laufer, *Field Museum Anth.*, Chicago, 1913, ser. Vol. XIII, No. 1, p. 11.

* *Histoire de la Louisiane*, Paris, 1758, Vol. I, p. 326.

Notes

exists only in an incomplete form, but in it is the following description of sapphire mining: "In a wilderness in the interior of Great Scythia there is a valley begirt with a stoney mountain as the walls. It is inaccessible to man and so excessively deep that the bottom of the valley is invisible from the top of the surrounding mountains. So great is the darkness that it has the effect of a kind of chaos. To this place certain criminals are condemned whose task it is to throw down into the valley slaughtered lambs, from which the skin has first been taken off. The little stones adhere to these pieces of flesh. Whereupon the eagles, which live on the summits of the mountains, fly down, following the scent of the flesh and carry away the lambs with the stones adhering to them. They then who are condemned to this place, watch until the eagles have finished their meal and run and take away the stones." The story in whole or in part has been copied and copied, the last user being Dumas in his tale *The Count of Monte Cristo*. As Berthold Laufer points out, the tale had traveled as far as China by the 7th century, and the Arabs told it about 1000 year ago. While first referring to sapphire mining, the legend in most of its variations refers to diamond mining and in others to balas ruby, and in still others to precious stones in general; the tale's habitat ranges from the Caucasus through Tibet, Khorasan, Kashmir, and India to Ceylon; horrid snakes capable of swallowing an elephant guard the gems in many versions, and Alexander the Great is linked with some variants of it. The myth is doubtless derived from the method by which, according to Herodotus,* the Arabians gained cinnamon from the nests of great birds. Herodotus says rolls of bark, our cinnamon, are brought by large birds to build their nests against precipitous mountain cliffs, inaccessible to man. To surmount this difficulty, the Arabians proceeded as follows: "having cut up into large pieces limbs of dead oxen and asses and other beasts of burden, they carry them to these spots and, having laid them near the nests, they retire to a distance. But the birds, flying down, carry up the limbs of the beasts to

* *Thalia*, Book III, art. 3.

their nests which, not being strong enough to support the weight, break and fall to the ground. Then the men, coming up, in this manner gather the cinnamon, and being gathered by them, it reaches other countries." This seems to me the probable origin of the myth and not, as B. G. Niebuhr suggests, the divine eagles who bore Aristomenes from his hideously deep cave prison after the second Messenian War.

7. As to Pliny's statement that tribute was paid with turquoise, jade was eagerly accepted by the Aztec rulers as tribute from their vassals even as did the Chinese emperors accept as tribute the Khotan jade. As to the use of precious stones as currency, today in Tibet inferior turquoise from the size of a number two shot to that of a bullet is used in place of small coin. Three hundred and fifty can be procured for twenty-one *taels*.^{*} Among the Indians of our own Southwest, turquoise was as near a unit of value as they had.^{*} The Mayas also used precious stones as money.^{*} Plato (in *Eryxias*) about 400 B.C. says, "In Ethiopia they use engraved stones instead of money." The Egyptians may have used *scarabaei*, manufactured by the thousands, as small change, larger sums being paid by heavy massive gold rings. Nicolo Conti, a Venetian traveler in India, early in the 15th century used cat's-eyes as currency. Some three generations ago, uncut diamonds are reported to have circulated as currency in and near Diamantina, Minas Geraes, Brazil.

8. Among the Tibetans today, the wealth of the women is largely represented by the turquoises of their turquoise-set headdress called *peyrock*, that of even a woman of low caste frequently being worth \$125.

9. The combination of gold and turquoise is still a peculiarly pleasing color combination and I may add at the moment a very fashionable one.

10. The color of turquoise is frequently ruined by contact with oils or even human perspiration.

11. While Pliny mentions Arabia as a source, notwithstanding his excellent authorities as to the precious stones of Africa, Pliny apparently did not know of the earliest commercial source of turquoise, i.e., the

* Capt. Wm. Gill, *The River of the Golden Sand*, London, 1880, p. 77.

* Sydney H. Ball, *Bul. 128. American Bur. of Ethnology*, Washington, 1941, pp. 5, 233.

* *Cogolludo*, Lib. IV, Cap. 3, 1688 A.D.

Notes

Sinai Peninsula.* This was the world's oldest large mining operation. If not operated in Pliny's day, at least Roman travelers probably visited it, as fragments of Roman pottery have been found at the mines. Turquoise is still obtained in the region by the Arabs. Pliny may, however, refer as his Arabian source to the ancient mines farther southwest near Ziba.*

12. Doubtless, a garbled version of Herodotus' tale as to how cinnamon is obtained in Arabia.*

* Sydney H. Ball, *Turquoise Mining in 3200 B.C.*, 1927, pp. 483-5.

* R. F. Burton, *The Land of Midian*, London, 1879, Vol. I, p. 11.

* Book III, art. 3.



CHAPTER XXXVI

1. Malachite for many centuries has been obtained from the Sinai Peninsula.

2. Nero, a patron of the Green Faction, once sanded the circus arena with powdered malachite. Caligula* did likewise. Heliogabalus regretted that, after strewing gold and silver dust about a portico, he could not also strew the dust of amber.*

3. The idea that malachite preserved children from convulsions and other evils continued into the Middle Ages.*

* Suetonius, *Calig.* XVIII, 3.

* Aelius Lampridius, *Scriptores Historiae*, Loeb Classics, David Magic, translator, Vol. II.

* Nicolo, *Arcula Gemmea*, 1653.



CHAPTER XXXVII

1. Our word jasper comes to us through the Latin from the Greek, the Greek word being evidently of oriental, but otherwise unknown, origin.

2. Plato (428-347 B.C.), in *The Phaedo*, mentions jasper.

3. In the green variety, jade a stone sometimes used by the Romans, may be included, but compared to green jasper, jade was very rare in Rome. The *jaspis*

* Emerald.

* Ch. 51.

* H. Karajan, *Mineral Resources of Armenia and Anatolia*, New York, 1920, p. 137.

* *Nat. Hist.*, Book XXXV.

* *Metamorph.*, Book IX, 566, and *Tristia*, Book V, Elegy 4.
† *Amores*, Book II, Elegy 15.

* *Op. cit.*

resembling *smaragdus** and carried as a charm by the people of the East particularly, suggest jade. Jade and jasper were confused by Anselmus Boetius (1609) and many later scientists. Indeed, the jade tomb of Tamerlane at Samarkand was jasper to many of the Europeans traveling in Asia in the 20th century. The Neolithic people of Italy, from about 2500 to 1500 B.C., had axes of both nephrite and jadeite, probably fashioned from pebbles found on the shores of Lakes Neuchatel and Geneva, or possibly from glacial boulders. They were in the possession of both the lake dwellers and the early Italians of northwest Italy. Some of Pliny's *ceraunia** must include such axes and Pliny must have seen them.

4. *Aerizusa*: Some of the *sapphirine* (bluish chalcodony) used by the ancients is unusually fine.

5. Agates, onyx, and jasper occur in Asia Minor and Pontus toward Kerasun and Trebizond.* This was probably the source of Mithridates' wealth in vases made of these substances.

6. *Sphragis*: From the Greek for seal or signet, hence our sphragistics, the study of engraved seals. Eratosthenes (276-196 B.C.), in his geographic treatise, designated certain sections of the earth's surface *spragides*, or seals.

Sphragis is evidently a jasper. Red ochre or *rubrica* from Lemnas was never sold except in sealed packages (sealed with a signet); hence it also was sometimes called *sphragis*.* Ovid (43 B.C.-17 A.D.) twice mentions the fact that the signet before use is moistened, as is the custom today.* Again, Ovid† envies his mistress' signet, as in order that "the seal, neither sticky nor dry, might not drag the wax, should first have to touch the lips of the charming fair."

7. Dioscorides* states that jasper, if worn by the expectant mother, speeds delivery.



CHAPTER XXXVIII

While the term was also used for azurite and even for lapis lazuli and blue jasper, much *cyanos* was an artificial product.

The *Kyanos* of Homer,* decorating the frieze in the palace of Alcinous, was a glaze colored by copper salts. While this particular *kyanos* was presumably of Phoenician origin, the Egyptian jeweler made false turquoise even in predynastic times.* Such was the *cyanos* of Minoan and Mycenae prior to the 18th Dynasty (1580 B.C.), lapis lazuli, crushed, was used by the Egyptians as coloring matter; thereafter the pigment used was a copper ore, although as early as 1300 B.C. cobalt was used in Egypt as a colorant.

The names azurite, lapis lazuli, lazurite, and a later Latin word *lazurius* are all derived from the Arabic word *lazward*, meaning blue.

* Od. VII, p. 87.

* Sydney H. Ball, *The Egyptian Gem Stones of Pre-Ptolemaic Days*, *Jewelers' Circular*, Feb. 23, 1928, p. 153.



CHAPTER XXXIX

1. The Latin word *sapphiros* and the Hebrew *sappir* presumably are of Sanskrit origin, indicating that lapis lazuli was obtained by the earlier classical people from Badakhshan via Indian trade centers as it was in Pliny's time.* The name *sapphiros* for lapis lazuli was used as late as 1546 by Agricola.

According to Babylonian science (3000-2000 B.C.), stars were transformed into animals, metals, and stones. One of the stones of this origin, was lapis lazuli. This inference was doubtless derived from the iron pyrite crystals seen in the finer specimens of the gem. That the "sapphire" of the Bible is also lapis lazuli is shown by Job.* "The stones of it are the place of sapphires, and it hath dust of gold (i.e., pyrite)." The book was written possibly in the 4th century B.C.

Lapis lazuli from the Badakhshan mines, still

* *Periplus of the Erythraean Sea*, translated by Wilfred H. Schoff, New York, 1912, p. 38.

* 28:6.

A ROMAN BOOK ON PRECIOUS STONES

* Sydney H. Ball, *Egyptian Gem Stones of Pre-Ptolemaic Days*, *Jewelers' Circular*, April 26, 1928, pp. 39, 41.

* Sydney H. Ball, *Historical Notes on Gem Mining, Econ. Geol.*, 1931, Vol. XXVI, pp. 728-9.

* Sir Percy Sykes, *A History of Persia*, London, 1921, Vol. I, pp. 33, 117-9.

* *Les Six Voyages de Jean Baptiste Tavernier Premiere Partie*, Paris, 1677, p. 557.

* *Quaest. Conviv.* III, 1, 3617 B.

* Book XIV, Epigram 154.

worked on a small scale, was one of the most precious commodities of ancient commerce.* The Badakhshan (Afghanistan) lapis lazuli mines are first specifically mentioned by the Arab Istakhri (951 A.D.). That they were, however, opened up 4000 B.C. is suggested by fairly strong circumstantial evidence.*

Assyrian inscriptions describe Mount Bikni (the modern Mt. Demavand) as "a mountain of Uknu (lapis lazuli)" but we know of no ancient mines in that vicinity.* Could the mountain have been at that time a trading center on the caravan route along which lapis lazuli from Badakhshan was carried?

2. Pliny's statement "it is not suitable for engraving when intersected with hard particles of a crystalline nature" is most interesting. In reality lapis lazuli is not a mineral but a rock consisting of three minerals, hauynite, calcite, and pyrite. As the hardness of these minerals, according to Mohs' scale ranges from three to six and one half, the difficulties of the engraver, as set forth by Pliny, are not surprising.

3. Egyptians imitated both turquoise and lapis lazuli with blue frit even in predynastic time.

Tavernier states that in the reign of Shah Abas II there was found in a Persian copper mine a vein of *azur* much of which was used in Persia for coloring tiles. The discovery of this copper ore (azurite) rendered it no longer necessary to import true *azur* (lapis lazuli) from Tartary.*

4. For Dionysius Periegetes' description of the occurrence of lapis lazuli, see Introductory Chapter 9.



CHAPTER XL

1. Plutarch* states that its name came from the color of wine mixed with water. The word appears to come from the Greek "a" (not) and one meaning to intoxicate. Martial* (40-104 A.D.) evidently believed such to be

Notes

the origin of the word, as, regarding amethyst-colored wool, he states "since I am drunk with the blood of the Sidonian shellfish, I do not see why I should be called a sober wool."

2. *Pharanitis* is named after the city of Pharan, Arabia.

3. The color of amethyst is often irregularly distributed. The top of a crystal, for example, may be of fine purple color and the base colorless or whitish. Pliny's fifth variety evidently refers to this type.

4. *Paederos* (lovely youth) here is evidently another name for amethyst. In other places, however, Pliny says many authors so called opal.

In explanation Pliny, in Chapter 45, states the name *paederos* has been so bandied about among beautiful precious stones it has merely come to mean one charming to the eye.

5. Pliny is here again annoyed at the magicians' contention that the amethyst is a preventive against drunkenness, an exploded theory. The Romans in instances drank their wine from cups of amethyst.*

Among the superstitious, not only has each precious stone itself inherent medicinal or other marvelous properties, but such properties are strengthened by engraving on the stone certain designs or symbols. Both Asclepiades of Samos* (about 80 B.C.) and the younger Plato (possibly 428-389 B.C.) wrote epigrams on the subject. That by Plato the Younger, regarding a Dionysus carved on an amethyst, is worth repeating: "The stone is amethyst, but I am the toper Dionysus. Either let it teach me to be sober or learn itself to get drunk."* That by Asclepiades, or possibly by Antipater of Thessalonica (Augustine age), runs as follows: "I am Drunkenness, the work of a skilled hand, but I am carved on the sober stone amethyst. The stone is foreign to the work. But I am the sacred possession of Cleopatra; on the Queen's hand even the drunken goddess should be sober."* The myth evidently originated a long time ago, at least by 400 B.C.

The myth was also believed by the Aethiopian king in the romance written by Heliodorus (3rd century

* Martial, Book X, Epigram 49.

* *Anthologia Graeca* IV, 18, 9.

* W. R. Paton, translator.

* W. R. Paton, translator.

B.C.) as well as by Marbodius (1067-81 A.D.), Camillus Leonardus (1502 A.D.), Nostradamus (16th century A.D.), and the Arabs of the Middle Ages.

It is stated that some parsimonious knights of the Middle Ages, when their guests got slightly "high," were accustomed, for the rest of the evening, to serve water in cups of amethyst, to the probable satisfaction and certainly to the benefit of their guests.

* Ch. 60.

6. Pliny also sneers at Zacharias, who likewise states that *haematitis** also insures the success of petitions addressed to kings. Other authors, however, have averred that other stones also gained the favor of kings and princesses, namely, the sapphire (St. Jerome, author of the *Latin Vulgate*, 340-420 A.D.); and Marbodius (wrote 1067-81); and peridot (Camillus Leonardus, 1502).



CHAPTER XLI

* *Natural History of Precious Stones*, London, 1867, p. 245.

* Ch. 30, art. 32.

1. As C. W. King points out,* while Pliny's description of *hyacinthos* is too indefinite to determine its equivalent among our gemstones, the description by Solinus* (probably lived in the first half of the 3rd century A.D.) would be recognized by any mineralogist as that of sapphire. He not only describes its color, but says it is very hard and "could only be engraved and cut into shape by the use of the diamond." He adds: "to the best of his knowledge, diamond alone is harder."

* Loeb Classics, J. Wight Duff and Arnold M. Duff, translators, London, 1934, line 137.

In one of the minor Latin poems, the *Phoenix*, presumably by Lactantius or possibly another poet of the early centuries of our era, the eyes of the bird "you would take for twin sapphires."* Here both a blue color and translucency, and the *hyacinthos* here is doubtless our sapphire.

Sapphires appear in western jewelry among the Etruscans (600-275 B.C.) and were used by the Greeks

Notes

and Romans from 400 B.C. on. It was one of the stones, and usually of a pale tint most frequently used in jewelry in late Roman times. We may consider Ceylon the principal source at that time.* Sapphire is usually found as a pebble in alluvial deposits. Naumachius,* early in our era, recognizes this, for in describing sapphire and jasper, he says:

*"Stones are they, scattered o'er the pebbly coast,
Or on the torrent's brink at random toss'd."*

The *Periplus of the Erythraean Sea*,* a book written more or less in Pliny's time, states that *hyacinthos* (sapphire) was obtained by Roman traders at the port of Nelcynda (near Cochin), India. Cosmas Indicopleustes,* writing in the 6th century A.D. described Ceylon "where the hyacinthus stone is found." Sapphire is perhaps the most characteristic of the gems which Ceylon produces.

Constantine (288-337 A.D.) had a signet ring containing an engraved sapphire which weighed fifty-three carats. This stone was known in our time to be in the possession of Prince Trivulzio of Milan.

Claudian says that the Roman emperor, Theodosius I (reigned 379-95 A.D.) left to his two sons, Honorius and Arcadius:

*"Helmets shining green with emeralds bright.
And breast-plates rich with precious sapphires dight."**

—(C. W. King translation).

Camillus Leonardus, at the end of the 15th century, is the first to apply the name *sapphirini* to the blue corundum we know as sapphire.



CHAPTER XLII

1. While largely topaz, yellow sapphire, yellow zircon, and yellow garnet (hessonite) were doubtless in part included under *chrysolithos*. Indeed, it was not known that hessonite and hyacinth (zircon) belonged to different mineral species until the end of the 18th century.

* Sydney H. Ball, *Historical Notes on Gem Mining. Economic Geology*, Vol. XXVI, 1931, pp. 714-5.

* *Marriage Precepts*, v. 58.

* Wilfred H. Schoff, translator, London, 1912, pp. 45, 226.

* *Christian Topography*, Hakluyt Soc. London, 1897, Book XI, p. 364.

A ROMAN BOOK ON PRECIOUS STONES

2. Pliny's Aethiopian locality for topaz may be the Egyptian locality near the emerald mines of Jebel Zabara. We do not know when this occurrence was found, but its exploitation dates from at least 323 B.C.

3. While I know of no topaz in south central Asia, topaz occurs in Siberia, in Transbaikalia, and on the east slope of the Urals. I doubt if topaz was or is found in Pontus.

* *Elegy VII to
Cynthia.*

4. Propertius* (50-15 B.C.) is jealous because his grasping mistress received from his rich oversea rival:

"Emeralds and topaz of gleaming yellow hue."

Perhaps, understandingly, he hopes that they will

"Be turned to earth and water in thy sight."

5. Pliny states that the best gems of this species make gold appear as if it were silver. The shrewd and unscrupulous diamond dealer today places beside a slightly off-color yellowish diamond a much more yellow brilliant; the first appears blue white.

6. The use of foils to enhance the beauty of gems was an old trick. In Minoan art (2000-1000 B.C.), rock crystal was backed with either silver or blue frit to enhance its beauty.



CHAPTER XLIII

1. In Pliny's time yellow stones were no longer fashionable.

The color, the lightness of the variety from Pontus, and its association with rock crystal strongly suggest citrine or yellow quartz. The large size of the specimen mentioned is in line with this inference.



CHAPTER XLIV

1. In Chapter 37 *capnias* is a variety of jasper of a smoky appearance; both may be smoky quartz.

Notes

CHAPTER XLVII

1. Thomas Nicols,* quoting Boetius, says it is composed "of divers starres united together in longitude, which may easily be separated either with the hand or by the help of some instrument, and in their separation they shiver into the form of starres," and this last Anselmus Boetius (1609 A.D.) calls "Asteria vera."* Apparently even in the 17th century it was recognized that each fragment of a star sapphire, split parallel to the vertical crystal axis, shows a star.

* *A Lapidary or the History of Pretious Stones*, Cambridge, 1652, p. 156.

* lib. 2, p. 151.



CHAPTER L

1. Probably quartz cat's-eye, as Pliny states that it "resembles the eye of a fish." We would, however, remark that moonstone was once called "fish-eye," as was less often opal.



CHAPTER LI

1. The Latin name *ceraunia* means "lightning darting." Heliogabalus, fearing a violent death, had at hand an antidote against supposed poison from moonstone, sapphire, and emerald.* Most of us have drunk sandy creek water without ill effects.

2. Dr. Max Bauer* says that the "more or less porous mass" of Hungarian mother-of-opal, to enhance its beauty, is sometimes "soaked in oil" and then gently heated. The background is thus darkened, while the flecks of precious opal are not affected.

3. *Baetyli* were evidently meteorites and the name may be derived from the Phoenician *Beth-el* (House

* Aelius Lampridius, *Scriptores Historiae Augustae*, David Magie, translator, Vol. II, Ch. 33, p. 171.

* *Precious Stones*, L. J. Spencer, translator, London, 1904, p. 379.

of God) in which a meteorite was worshipped. Primitive peoples in both the Eastern and Western Hemispheres have long worshipped meteorites and the earliest irons, those of Troy, for example, were of meteoric origin. Among the Egyptians, iron ore was known as "heavenly ore" or "skystone." In the Sahidi dialect, the purest of the Coptic, iron is *benipi* or *banipe* and is the same in the hieroglyphs of the 6th or 7th king of the 1st Dynasty;* among the Babylonians, *An-Bar* or "stone of heaven." In the Bible, it is stated that "the city of the Ephesians is a worshipper of the great goddess Diana and of the image which fell down from Jupiter."* The Aztecs had but little iron, but when Cortes inquired the origin of that which they had, the Indians pointed to the sky. The Javanese believe that meteorites falling from heaven are messengers of the gods. Every meteorite is the property of the king and royal daggers are made from them. Meteorites, as they come from heaven, are worshipped in Pechili (China) and Manchuria. (See also note under *brontea*.) In ancient Greece and Rome, when a meteor fell, the event was recorded by minting a new coin.

4. Stone arrows and axes of prehistoric peoples (Sotacus' *cerauniae*), wherever found, have always been considered of supernatural origin by uneducated persons, by barbarian, and by semicivilized peoples pretty well throughout the world. The myth that such artifacts are closely connected with lightning is also widespread. The first to state that axes and arrowheads were not thunderbolts but stone weapons shaped by man was an Italian physician, Michael Mercati, shortly prior to 1600. Later this idea was supported by John Woodward in 1728 and John Frere in 1799 (in a report to the Society of Antiquaries).

In the venerable Roman shrine of Jupiter Feretrius, there were kept certain ancient flint stones used ritualistically; when a citizen took a solemn oath in private matters, or when the government was signing a treaty of peace. Presumably these were either paleolithic or neolithic arrowheads or axes.

Sir James G. Frazer believes that the wide dissemina-

* *Devonshire Assoc. for the Adv. of Sciences, Literature and Arts*, Basil H. Cooper, trans. 1869.

* Acts 19:35.

Notes

tion of the idea linking prehistoric arrowheads and axes, on the one hand, and lightning, on the other is due to the fact that primitive man made fire with flints.*

The popular German name for prehistoric stone axes is *donner-keil* or thunderbolt; *lingui d coa* (cat's tongue) in Picardy; *lingue di San Paolo* (tongue of St. Paul) in Abruzzi, Italy; and "axes of the fox" in Japan.

Suetonius* states that when Galba was governor of some of the Spanish provinces, a thunderbolt descended on a lake shore, and search of the place revealed twelve axes. This was regarded as a sure sign that Galba, as he later did, would become emperor. In Italy today, prehistoric stone axes and arrowheads are, among the common people, known as "lightning stones" (*pietra del falimine*). Signor de Bosis of Ancona got from the peasants of the Marches seven flint arrowheads. They are treasured since they protect the homes of their owners from lightning, as "the lightning comes down to strike with a similar stones." The same belief exists in Piedmont.* Sir Richard F. Burton† describes an ancient Etruscan necklace with a flint arrowhead as a pendant.

In France ancient arrowheads, set in silver or gold were used as ornaments. They were supposed to come from the sky. In Brittany the peasants still build prehistoric stone axes into their chimneys to ward off lightning.*

In East Prussia stone axes are believed to come from the sky and are a protection against lightning.

In Ireland arrowheads set in silver are considered powerful amulets.

Water in which a prehistoric axe has been boiled has, within a generation, been used as a cure for rheumatism in Cornwall.

Among the common people of Scotland, flint arrowheads are called "elf shots"; they are the arrows of elves, with which the latter attack both cattle and men.*

Other Scots who found prehistoric axheads dubbed them "purgatory hammers," as they believed ancient

* *The Golden Bough*, Pt. I, Vol. I, pp. 373-4.

* *Opera*, Leipzig, 1886, p. 203.

* Bartolomeo Gastaldi, *Lake Habitations and pre-Historic Remains in Italy*, London, 1865, pp. 5, 6, 39.

† *Etruscan Bologna*, London, 1876, p. 41.

* Harold Bayley, *The Lost Language of Symbolism*, Philadelphia, 1913, Vol. I, p. 125.

* James Logan, *Scottish Gael or Celtic Manners*, Hartford, 1847, pp. 225-7.

* R.V.D. Magoffin and Emily C. Davis, *The Romance of Archeology*, New York, 1929, p. 167.

* Charles R. Beard, *Lucks and Talismans*, London, p. 165.

* B. Laufer, *Jade*, Field Museum, Chicago, 1912, pp. 54-7, 63-4.

* N. B. Dennys, *The Folklore of China, etc.*, London, 1879, p. 121, also C. W. Loughby Meade, *Chinese Ghouls and Goblins*, New York, 1926, pp. 165-6, 332.

* *Jade*, Field Museum Chicago, 1912, p. 64.

* C. Neil Munro, *Prehistoric Japan*, Yokohama, 1911, pp. 52, 111; also B. H. Chamberlain, *Things Japanese*, 1891, p. 23.

* *The Magic Jewels and Charms*, Philadelphia, 1915, p. 109.

* Dr. Antonio C. Simoens da Silva, *Congres Internat. des Americanistes*, C. P., 1915, Vol. XIX, pp. 234-5.

† *Points of Contact of the Prehistoric Civilization of Brazil and Argentine, etc.*, Proc. XVIII, Cong. Int. des Americanistes, London, p. 304.

* *Congres Internat. des Americanistes*, 1877, Tome 2, p. 2, 292.

people had the axes buried with them so that they could knock successfully at the doors of Paradise.*

The green banner of the Macleods of Dunvegan, so it is said, was given the family by Titania, the wife of Oberon, king of the fairies. It is embroidered with many "elf shots."*

Similar beliefs as to prehistoric axes and arrowheads are held by the peasants of Sweden and Spain and by the peoples of the Malay Archipelago, Assam, Burma, the Philippines, and Western Africa.

Some artifacts are known in China as thunderbolts, or "stone originating from the crash of thunder."*

The Lei-chau Peninsula ("thunder district") in Canton Province, China, is famous for its myths as to thunderstorms. After such storms, at times "hatchet-shaped things are picked up which are useful amulets."*

According to Berthold Laufer* in the 3rd century A.D. stone axes were called "axes of the crash of thunder." Emperor Su-tsung (756-62 A.D.) was given eight precious objects by a Buddhist priest which he had received from heaven, including stone hatchets. Early Chinese books on *materia medica* (10th century) state that such axes were only found where the thunderstorm had swept.

In Japan neolithic stone axes are called by the peasants *raifu* (thunder axes).*

George F. Kunz* states that the Brazilians call such artifacts "lightning stones" and that gold miners use them as divining rods. In Bahia, Brazil, some natives believe nephrite axes attract lightning and others that it protects against lightning.* Dr. da Silva† states that if the Chilean Indian finds an old axe, he keeps it to ward off lightning; the Brazilian throws it as far from his house as possible, fearing it will attract lightning.

Medicine men among the Indians of the Bolivian plateau also have "lightning stones," though Dr. Nordenskiöld believed them meteorites. The present inhabitants of Dutch Guiana have similar beliefs.*

The Sioux Indians of our time are said to be unaware

Notes

that the stone arrowheads were the weapons of their ancestors and, if found, they are regarded as evidence of the evil spirit which existed before man was created.*

Among the Yuma Indians arrowheads were not attached to necklaces, as among the Western Apaches, as this would cause lightning to strike the wearer.* The Hopis believe that the old arrowheads ward off lightning.

The native tribes of southern Nigeria believe that ancient axes are hurled to the earth by the Lightning God.

The Negroes of the Bahamas call the prehistoric stone axes and arrowheads sometimes found in those islands "thunderbolts," and they are cherished as amulets, particularly efficacious against lightning. They claim they have seen them descend from the skies during thunderstorms.* E. G. Squier adds that in both the Bahamas and Jamaica stone axes are called thunderbolts and one in the latter is kept in an earthen water jug "to keep the water cool."*

The black peasants of Grenada, West Indies, also call prehistoric axes thunderbolts and believe they fall from the sky during storms.*

The Negroes of St. Vincent Island, West Indies, hold similar belief and, as proof of their celestial origin, state that "thunderbolts" are more commonly found after heavy rains, not realizing that the rains merely wash from them their covering of soil.*

In Santo Domingo they are called *piedras de Rayas* (Spanish equivalent of "thunderbolts").*

The present inhabitants of the Caicos Islands, West Indies, use old stone implements as amulets against thunder and lightning, of which they are most fearful.*

The natives of Margarita Island, Venezuela, similarly regard prehistoric stone weapons as do other West Indians.*

Judging from the names given tektites (moldavite and related natural glasses), semicivilized people may have seen them fall from the sky. In the Philippines they are known as *taeng kulog* or "thunder stones,"

* Charles E. Deland, *South Dakota Hist. Collections*, 1906, Vol. III, p. 568.

* Leslie Spier, *Yuman Tribes of the Gila River*, Chicago, 1933, p. 103.

* Fred A. Ober, *Our West Indian Neighbors*, New York, 1904, pp. 9-10.

* *Observations on the Chalchihuatl, Annals of the Lyceum of Nat. Hist. of New York*, 1869, p. 20.

* John W. Vandercook, *Caribbean Cruise*, New York, 1938, pp. 238-9.

* Fred A. Ober, *Camps in the Caribbees*, Boston, 1880, p. 106.

* Fred A. Ober, *In the Wake of Columbus*, Boston, 1893, pp. 81-2.

* Theodoor de Booy, *Am. Anthropol. N.S.*, 1916, Vol. 14, p. 98.

* Theodoor de Booy, *Notes in the Arch. of Margarita Island, Venezuela*, pp. 9-10.

taeng bituin or "star stones," and *batong-arao* or "sun stones"; in Malaysia, "thunder-stones," lightning-stones," or "moonballs"; in Indo-China, "thunder-stones" and "devil-balls," and in Colombia, "lightning-balls."*

* Dr. H. Otley Beyer, *Philippine Tektites*, *Philippine Magazine*, 1935, Vol. XXXVII, No. 11, p. 331.

It is frequently stated that the Hindus consider diamonds rock crystal transformed by lightning. It is further stated that the richest diamond deposits are those containing "thunderbolts" (ancient stone axes). Ancient axes also occur in many of the African alluvial diamond fields.

Flint, from which fire was produced among the Quiches and Iroquois, was believed to fall from heaven.

There are a number of other books which give excellent accounts of the superstitions regarding stone axes and arrowheads.*

* Thomas Wilson, *Arrowpoints, Spearheads and Knives of Prehistoric Times*, *An. Rept., Smith. Inst. for 1897*, Washington, 1899, pp. 841-6. Also Sir James G. Frazer, *The Golden Bough*, London, 1926, Vol. II, pp. 373-4. Also *Balder the Beautiful*, Vol. I, pp. 14-5, 303.



CHAPTER LII

1. Evidently some iris with which Pliny was familiar had as the base of the crystal, rock crystal, uncracked. The iris is hence called "root of crystal." This is, so far as I know, the earliest use of word "root," now familiar to us as "root of emerald," etc. (for a related subject, "ripening" of gems, see notes under *Tanos* and *Chalcosmaragdus*).

Queen Charlotte on March 1, 1760, gave the first Duchess of Northumberland* "a very fine snuff box of Root of Amethyst."

2. Related to the idea that stones ripen, was the one that less precious stones are the homes or matrices of more precious stones. The idea persisted widely to the beginning of perhaps the present century and is not wholly extinct today.

We quote Thomas Nicols,* the balas ruby is "the matrix domicile or palace in which Carbuncle or true Ruby is begotten." Albertus Magnus (1193-1280) is

* *The Diaries of a Duchess. Extracts from the Diaries of the First Duchess of Northumberland*, (1716-76), edited by James Greig, New York, 1926, p. 54.

* *A Lapidary or the History of Precious Stones*, Cambridge, 1652, p. 59.

Notes

less specific. He says that the *balagius* is the female of the ruby "and some say it is his house." Camillus Leonardus* states that the balas often contains a ruby in its interior; hence the saying: "the Balasius is the carbuncle's home." The idea grew from the common occurrence of spinel rubies and true rubies in one of the first known ruby deposits, that of Badakhshan.

Prase, particularly among the French, is still sometimes known as the root or mother of emerald, as it was formerly supposed to be the mother rock of emerald. Andreas Baccius* calls it "the house, domicile, or palace of the emerald which is found in it or attached to it."* John Hill, the translator of Theophrastus,* states that prase is often the matrix of emerald and is called the root or mother of emerald as the latter gem is sometimes found adhering to it. Some prase when cut is "not distinguishable from genuine emerald." To Camillus Leonardus, prase is also "the House of Emeralds." This myth doubtless stems from the confusion in the Middle Ages of fine prases and poor emeralds, as well as from Theophrastus' and Pliny's statement that part of a single mineral specimen is prase or green jasper and part emerald. (See notes, Chapter 19.) About 1850, among the French, (less than a century ago) green fluorspar was also the home of the emerald. It was also called *prime d' emeraude*.

Among the French, opal matrix is called *prime d' opal*.

The Hindus are said to consider rock crystal the mother or husk of the diamond, the former being the unripe and the latter the ripe gem.*

While "root" in English and "prime" in French were applied especially to the common green stones from which emeralds were "derived," they were also used in describing stones from which sapphire and amethyst might be transmuted. As a practical matter in nature, the point of a crystal might be transparent and well colored, the base semitransparent and spottily colored—the first fit for jewelry, and the second only for seal cutting—if at all. The idea is dominantly an European one.

* *The Mirror of Stones*, English translation, London, 1750, p. 78.

* *Elpidiani Philosophi*, Francfort, 1603.

* Thomas Nicols, *A Lapidary or the History of Pretious Stones*, Cambridge, 1652, p. 97.

* *History of Stones*, London, 1746, p. 73.

* Harry Emanuel, *Diamonds and Precious Stones*, New York, 1873, p. 154.

CHAPTER LIV

1. In preceding chapters, Pliny has described the more important gems, grouping them according to their color. This was the ordinary method of classification until about 1768 when Quist, a citizen of Stockholm, proposed a system founded on the weight, crystal form, and hardness of the gems. His system would be a fairly satisfactory one, even today.

* Edited by William Bray, London, p. 75. etc.

2. John Evelyn in his *Diary*,* covering the period 1641 to 1706, constantly uses *achates* for agate.

3. In Theophrastus' time, agate was "sold at a great price."

4. The river Achates, Sicily, in the Vale de Noto, is our Drillo. At least up to a short time ago, the lapidaries of Palermo, Sicily, cut native agate into all sorts of ornaments and jewelry.*

* Henry Barbet de Jouy, *Les Gemmes et Joyaux de la Couronne*, Musée Impérial du Louvre, Paris, 1865, Plate XXIV.

* *Precious Stones*, translated by L. J. Spencer, London, 1904, p. 506.

* *The Birthday of Cynthia*.

5. The average size of agates greatly exceeds that of most precious stones.

6. Dr. Max Bauer* describes "the yellow *ceragate* (wax-agate or semi-carnelian) which has a waxy lustre." Propertius* (50-15 B.C.) asks her at the banquet celebrating the event to dispense nard from a box "of yellow agate."

7. *Dendrachates*: Moss agate is still known in Italy as *pietra albero* (tree stone).

In Onomacritus' *Lithica* (once supposed to date from 516 B.C., but more probably of the 2nd or 3rd century A.D.), we find the following:

"The immortal gods will view thee with delight,
If thou shouldst hold the agate branching bright,
With veins like many a tree, that rears its head
In some fair garden, with thick boughs bespread;
As the tree-agate thus to mortals known,
In part a branchy wood; in part a stone.
If on thy oxen's horns this gem be bound,
When with the cleaving share they turn the ground,
Or on the unwearied ploughman's shoulder borne,
Then shall thy furrows spring with thickening corn;
Full-bosom'd Ceres with the wheaten crown,
Shall lean from Heaven, and scatter Harvests down."

* *Precious Stones*, p. 497.

8. As to *coralloachates*, Dr. Max Bauer* states that

Notes

a white fossil coral with a flesh-red matrix is called by the Oberstein lapidaries "coralagate." It is reported to come from Aden, Arabia.

9. When Pliny states that agate is a cure for the bites of spiders and scorpions, he is not convinced, for he adds "it is the belief of the common people." Among those who may have independently held this belief, but more likely copied Pliny, were: the Hellenistic Damigeron (100-500 A.D.), who, however, powdered the stone; Orpheus, of about the same time; Marbodius (1067-81), the West Saxons of England in the 11th century; Camillus Leonardus (1502); and Reginald Scot.* Jasper, another member of the quartz family, has the same virtue, according to the Orphic poem just mentioned (2nd and 3rd century); the Arabian, Ibnu'l Boitar, (1219); and De Boot (1690). Slightly before Pliny's time, Dioscorides (2nd century) states that one swallowing lapis lazuli is immune to scorpion stings. The Pseudo-Aristotle of the 9th century agrees, but Ibnu'l Boitar, (1219 A.D.) changed the stone to turquoise in which he was followed by Tiefeschi, the Arabian mineralogist of the 13th century, and by Camillus Leonardus (1502). Johannes Braunni (1680 A.D.), however, ascribes the virtue to sapphire.

St. Jerome (340-420 A.D.) informs us that if a sapphire is put in a glass with a spider, the latter will die; so also Bartholomew Angelicus and other Middle Ages scientists.

10. Ctesias* (at Persian court 415-397 B.C.) says that in India "there are certain high mountains having mines which yield the sardine-stone and onyxes and other seal stones." The fine carnelians found in the ruins in the northwest part of the Indus Valley, dating about 3500 B.C., suggests these deposits were known long before Ctesias' time.

11. Agate mortars and pestles are still widely used in the chemical and drug industries. This is one of the earlier notices of the industrial uses of precious stones.

12. Pliny's statement that agate held in the mouth allays thirst has a certain amount of truth in it, as

* *Discoverie of Witchcraft*, 1584.
Ch. 54.

* J. W. McCrindle,
Ancient India as described by Ctesias the Knidian Calcutta, 1882, p. 9.

pebbles held in the mouth allay extreme thirst in desert countries. Pliny is followed by Marbodius (1067-81 A.D.) and Camillus Leonardus (1502 A.D.). The latter adds that rock crystal has the same beneficial effect, provided it is held against the tongue. The Chinese also hail rock crystal as a thirst killer.

13. In Persia, Pliny tells us agates are believed to turn boiling water cold. The legend doubtless arose because all precious stones are cool to the touch.

In the Middle Ages, chrysoberyl was supposed to cool boiling water when immersed in it.* Marbodius (1067-81) states that topaz (our peridot) "bids the bubbling cauldron cease to play." The *Honest Jeweller* (17th century) says the same of topaz (he also confuses peridot with it). See also Pliny as to *hephaestitis** and Leopold Claremont* as to chrysolite (peridot). The West Indian Negroes keep water cool by putting a prehistoric axe in it, (see *Ceraunia*, notes). Rulandus (1564) says the same of bloodstone. Berthold Laufer* states that according to ancient Chinese works, agate was tested by rubbing it with a piece of wood: if not heated, the stone is genuine: if heated, it is false. This test is based on the supposed unchangeable coldness of agate, the property cited by Pliny, and there is probably a connection between the myths.

14. The belief that gems or jewelry render warriors and other owners invincible is an old one. In the next paragraph Pliny himself says that Milo of Crotona was rendered invincible in athletic contests by an *alectoria* which he carried. The myth is widespread both in Europe and the East but probably originated in Europe where the earliest variants are found.

Besides agate and *alectoria*, the diamond,* the beryl† and the loadstone* had this virtue: and eaters of powdered rock crystal among the British Guiana Indians were invincible if we can believe one who traveled there in 1590. A stone from the regalia rendered Henry III of England (13th century) invincible in battle, but unfortunately this sovereign remedy was stolen by Hubert de Burgh. The old Shahs of Persia had a large diamond in a scimitar and so long as the incum-

* Giovanni Battista Porta, *Magiae Naturalis*, 1615 A.D., Camillus Leonardus, 1502, and De Boot.

* Ch. 60.

* *The Gem-Cutters Craft*, London, 1906, p. 83.

* *Agate, Archaeology and Folklore*, Field Museum, Chicago, 1927. p. 31.

* Marbodius (1067-81 A.D.), Boniface and Rabbi Benoni of the 14th century.

† Arnoldus Saxo, 1220 A.D.

* Lhuya, 17th century.

Notes

bent possessed it he was invincible. He also possessed a cube of amber which fell from heaven and this was equally potent. According to an ancient Arab legend (before 570 A.D. at least), an Arab chieftain owned a pearl from the mouth of a dragon which made him invincible. The "stone" from the joints of bamboos called *tabasheer* renders one immune from wounds by iron weapons, or so Friar Odoric (1320) learned in Java.

Jewelry had in instances the same virtue. According to an early Hindu myth, Brahma gave Darida a bracelet which rendered him invincible but as soon as he lost it he was killed. Prehistoric axes rendered invulnerable the Burmese and southwestern Chinese.* In Burma, Siam, and in Cochin-China warriors insert small precious stones or metal plates under the skin, thus rendering them invincible. When Kublai Khan invaded Japan* in the 13th century, eight Japs of a single garrison had diabolical charms under their skins. This rendered them immune against iron weapons so when they were captured they were beaten to death with wooden clubs.

15. Alabaster: Alabaster* was exported in Pliny's time from the Arabian port of Muza, the modern Mocha.* Alabaster still is quarried in several places in that part of Persia anciently known as Carmania, for example at Yezd and at approximately 57° E. and 30° N.* Alabaster, once widely used at Nineveh and today at Baghdad, occurs in abundance in Mesopotamia. The alabaster quarry at Gozo near Malta is said by some to have been worked even before the Roman time.* The "onyx" quarries of Oran in Algeria were Roman sources of supply as were the Egyptian quarries certain of which were opened by the Egyptians as early as the 1st Dynasty. Strabo, in describing Upper Egypt, states that some tribes keep their dead "in the house enclosed in hyalus" (alabaster?)*. In his time, the body of Alexander the Great was kept in such a coffin.*

Of course, the use of alabaster as vases and bowls to

* R. Heber Bishop, *Investigations and Studies in Jade*, New York, 1906, Vol. II, p. 103.

* Marco Polo, Book III, Ch. 2.

* Book XXXVI.

* *Periplus of the Erythraean Sea*, translated by W. H. Schoff, London, 1912, p. 31.

* W. T. Blanford, *Eastern Persia*, London, 1876, Vol. II, p. 486.

* Maturin M. Ballou, Boston, 1893, p. 126.

* Book XVII, Ch. 2, Para. 3.

* Book XVII, Ch. 1, Para. 8.

contain unguents and as drinking cups dates from early Egyptian days.

16. *Alectoriae*: This was either a growth within the fowl or a vividly colored stone picked up by it to grind its food for birds are without a question attracted by such stones.

When diamonds were first discovered in South Africa, it was the contention of J. R. Gregory and others that the stones had been brought from the North by ostriches. "In Clarendon, Texas, Mrs. Don Grady, fixing a chicken for dinner, discovered inside it a diamond she had lost four months before."* Capt. C. S. Cochran writes that in the vicinity of the Muzo emerald mine "small emeralds are so plentiful that it is a common thing to purchase poultry merely to kill them in search of emeralds, which they are fond of: several are often found in the entrails of a large fowl and sometimes in a very pure and perfect state." One of my friends, who wears in his scarf pin a Colombian emerald of this origin, claims that the chickens show a considerable preference for emeralds as a grinding material, and this would appear to be a profitable field for some modern Mendel. Under the Colombian mining law the contents of the craws of chickens grown near the Muzo mine are state property. Apropos of this suggestion, a learned doctor of philosophy, writing in *Harpers Monthly* some fifty years ago, claimed that the cobras of Ceylon frequently swallow luminous pieces of fluorspar, mistaking them for glowworms.

As to the fable that it renders one invincible, see notes under *Achates*.

17. *Antipathes*, the "resister," according to the Pseudo-Plutarch, cures scabs and leprosy, if powdered and drunk with wine.

18. *Amphitane*: Pliny also mentions the gold digging ants of India.* In the latter passage, he also mentions Scythian gold excavated by the griffins.* The Arimaspi attempt to steal this gold from the industrious monsters. The ant myth stems from the works of Clearchus and Megasthenes, and Herodotus mentions the gold mining griffins,* quoting the poem of Aristeas.

* *Time*, Aug. 30, 1943, p. 94.

* Book XI, Ch. 36, and Book XXXIII, Ch. 21.
* Book VII, Ch. 2.

* *Thalia* III, art. 116.

Notes

Another old legend holds that griffins guard emeralds, a myth repeated by Nicols in 1652 and even by writers within the past sixty years. Its power to attract gold and to increase it may be an ambiguous reference to gold being set free when auriferous pyrite or copper sulphides weather.

19. *Apsyctos*: Evidently coal. Theophrastus, in Article 27, apparently describes coal, and again in Article 28.



CHAPTER LV

1. This and several other "precious stones" in Pliny's later chapters were fossil pentremites. They were known in the Middle Ages as Jew stones (*lapides Judaici*) as they occurred in the Cretaceous limestones of Palestine and were first brought to Europe by the Crusaders.

2. The Roman historians and scientists (Livy, Pliny, Plutarch and others) recorded the fall of meteorites from the heavens. Ctesias describes a fountain in India, Sides or Silas by name, from which "liquid gold springs up from a rock of pure iron." Each metal was equally precious, for a sword made of iron "if stuck in the ground," averted the wrath of the thunderbolts. But science, by the 18th century, had so "advanced" that museums which had stones which were said to have fallen from the heavens removed them from the exhibition cases, to save themselves ridicule.* In 1790, Prof. Stuetz wrote "that iron should fall from heaven might in 1751 have been believed even in Germany by sensible people on account of the then prevailing ignorance of natural history and physics, but in our time it would be impossible for such fables to find credence." In 1790 a meteorite fell at Juillac, France. It was sent by the mayor to the French Academy of Science. A committee was at once appointed: its re-

* Edwin E. Slosson,
Snapshots of Science,
pp. 135-7.

port "Is it not sad to see a whole municipality attesting in a formal protocol to a popular superstition? The philosophical reader can find nothing to say when he sees this authenticated testimony to an obviously false statement, a physically impossible phenomenon." In 1809, Professors Silliman and Kinsley reported the actual fall of a meteorite. Thomas Jefferson, not only a statesman but one of the leading scientists of his time, remarked he "would prefer to believe that two Yankee professors would lie rather than that stones should fall from heaven."*

* See notes under *Ceraunia*.

That *brontea*, a meteorite, could quench fires set by lightning parallels a belief held by many ignorant people regarding prehistoric axes, two substances evidently confused in early times.



CHAPTER LVI

* That learned work of Julius Solinus, *Polyhistor*, translated by Arthur Golding, Gentelman, London, 1590, p. 24.

* David Loth, *Lorenzo the Magnificent*, New York, 1929, p. 290.

* *As You Like It*, Act II, lines 13-15.

1. *Catochitis*: Solinus* states: "It is not so much a Jewell as a common stone." He adds it holds a man's hand "for there is in it, I cannot tell what, a kind of clammy glew and gummishnesse."

2. *Chelidonia*: When Lorenzo de Medici was on his deathbed, he was given by his physician, Petrus Bonus Auogarius, a bit of "celandine, and a red stone that grows in the stomach of the swallow" which was to be sewn into his shirt just under the left breast.*

3. *Chelonitis*: While perhaps not exactly apropos, we quote Shakespeare:*

*"Sweet are the uses of adversity
Which, like the toad, ugly and venomous
Wears yet a precious jewel in his head."*

Prior to the 19th century, the insane, being possessed of the devil, were treated with outrageous brutality. In instances, quacks cut their foreheads and by palming "removed" a stone, the immediate cause of insanity.

Notes

4. *Chloritis*: The bird is the blackcap, an Italian warbler.

5. *Chrysolampus*: Pliny's description reminds us of the *topazos* of Strabo and Diodorius Siculus, which shone brilliantly at night and by which property the miners found it. This supposed characteristic is not, however, recorded in Pliny's description of our olivine, the main gem variety of which is called peridot.*

* See notes under
Topazos.



CHAPTER LVII

1. *Daphnias*: Quoting Zoroaster, Pliny states that *daphnias* is a cure for epilepsy. Many precious stones through the ages are supposed to have had this medicinal virtue. Pliny himself elsewhere adds that *gagates* (jet) tends to detect a tendency toward epilepsy. Books on precious stones from early classical times to our own day mention some twelve other precious stones that are a cure for the disease. It is an European concept, although the Arabs and Persians of the 11th to 13th centuries mention it, they, however, probably having obtained the idea from western sources. It may be of interest to state that the German Johannes Braunni (1680), who advocated emerald as a cure, stated that if the disease were too far developed to be overcome, the emerald would break into fragments.

The belief that epilepsy could be cured by the king's touch and the use of the cramp ring was prevalent in England from the 13th century to 1877, as to the latter date at least locally in Suffolk. In the 17th century Thomas Russel was tried for treason because he spoke contemptuously of the king's touch.

2. *Draconitis*: Philostratus (3 B.C.-98 A.D.) in his *Life of Appolonius of Tyana** tells us that the Hindus attack the dragons of the foothills, kill them, and cut out the eyes which are marvelous precious stones with power for many secret purposes. In the head of the

* Translated by F. C.
Conybeare, London,
1912, Book III, Ch.
7.

* Book III, Ch. 8.

* Hakluyt Soc. edited
by Col. Henry Yule,
1863, p. 41.

mountain dragons, he adds, are "stones of flowery color which flash out all kinds of hues and possess a mystical power if set in a ring like that which they say belonged to Gyges."* Isidore of Seville (died 636 A.D.) tells practically the same story.

Albertus Magnus (1193-1280) describes a carbuncle in the dragon's head, copying Pliny. According to Friar Joranus, who traveled about 1330 A.D. in India Tertia, (Eastern Africa, south of Abyssinia),* there are dragons with "lustrous stones which he called carbuncles" in their heads. These, on attempting to fly, through their weight, crash into a river "which issues from Paradise," and there drown. After waiting seventy days, people "take the carbuncle, which is rooted in the top of the head, and carry it to the Emperor of the Aethiopians, whom you call Prester John." Camillus Leonardus, physician of Pisaro, in his book *The Mirror of Stones*, dedicated to Caesar Borgia, in 1502, says that the *draconites* is a precious stone, regarding the exact physical characteristics of which he is a bit hazy. "It is brought from the East, where there are great Dragons, for it is taken out of the head of dragons, cut off while the beast is yet panting. It loses its Virtue if it remains in the Head any time after the death of the Dragon. Some bold Fellows, in those Eastern Parts, search out the Dens of the Dragons, and in these they strew Grass, mixed with soporiferous Medicaments, which the Dragons, when they return to their Dens, eat and are thrown into a Sleep; and in that Condition they cut off their Heads and extract the Stone."

The legend of stones from dragons became extinct in Europe only 200 years ago. According to Dr. John James Schenschzer of Zurich (his extensive work was published in Leyden, 1723), a dragon-stone in the Museum of Lucerne cured almost all diseases. Rodolph Stempflin, he states, swore that in 1509 his grandfather, while mowing in a field, saw a dragon fly past him. The horrible sight prostrated him, but when he recovered consciousness, there, in a mass of blood excreted by the monster, was the dragon-stone.

Notes

This tale of the luminous gem in the head of a dragon is an adaption of the luminous gem in the serpent's head, presumably of Hindu origin. The Chinese variant of the legend substitutes the dragon for the snake, as does the Roman. But among the Romans of classic times there was little difference between dragons and snakes.* The Portuguese physician, Garcia da Orta (1563 A.D.) was perhaps the first to doubt the existence of luminous carbuncles.

Pliny gives as his main authority Sotacus, who lived at least as early as the 4th century B.C. and certainly previous to the time of Alexander the Great. Being a physician at the Persian Court, he presumably got the tale from India, regarding which country he wrote a book.

* For various variants of the tale, see Sydney H. Ball, *Luminous Gems, Mythical and Real: Scientific Monthly*, Dec., 1938, pp. 501-3.



CHAPTER LIX

1. *Galactitis*: It is believed to be a species of limestone. Among the Moslems of India, chalcedony, also a white stone, is supposed to increase the supply of milk to nursing mothers. Linschoten also states that chalcedony helps nursing mothers. According to Camillus Leonardus, crystal, if bruised with honey, increases the flow of mother's milk. Powdered rock crystal is preferred by Andreas Baccius (1603) for this purpose.

2. *Gassidanes*: Pliny describes a number of stones that conceive, most of them concretions like *gassidanes* and *aetites*.* That both gems and placer gold bring forth young was once a common belief among scientists and still prevails among the uneducated. There are several reasons. First, gem or gold placers, if permitted to lie fallow a few years, again yield gems or gold, since in the time interval the clay or other rock disintegrates and sets its valuable content free. Naturally, the ignorant miner believes that the gems or

* Book XXXVI.

gold not recovered in the first treatment have, between the two periods of mining, either grown or given birth to new gems or gold, as the case may be. Second, larger gems are often considered to be the "parents" of smaller gems. A large quartz crystal found in a Belgian Congo diamond placer was excitedly presented to the operating engineer, G. P. Newport, as the "mother of all diamonds." And third, the smaller of some twin crystals looks almost, even to a mineralogist, as if it were the offspring of the larger component. Further, the use of "male" and "female" as applied to stones from the earliest times certainly did not refute the idea. As to concretions, they are frequently hollow, and within the space is a detached fragment. When shaken the movement was likened to that of the child in its mother's womb.

The Babylonians of from 3000 to 2000 B.C. believed that stones lived and, indeed, they called what was probably a concretion "the pregnant stone." Thales (636-546 B.C.) endowed stones with a soul and a living personality. Pythagoras (6th century B.C.) believed that stones had souls and Plato (428-347 B.C.) held that precious stones live. The idea that stones were animate was common in the Middle Ages. For example, Hieronymus Cardanus (*De Subtilitate* 1540 A.D.) states that precious stones live, suffer diseases, then old age, and finally die. In the 16th century at Manta, Ecuador, a magnificent emerald represented the goddess Umina. The wily Indian priests taught the natives that the goddess loved to have smaller emeralds, her daughters, dedicated to her. Tournefort, the famous French botanist of the 17th century, believed that stones reproduce young. Certain Moslem tribes of the Caucasus Mountains today state that precious stones are living beings, that some are male and others female, and that they reproduce.*

We must go back to Democritus (5th century B.C.) for the first statement that stones reproduce one another. Theophrastus* a hundred years later states that the most wonderful quality of stones "is that (if the accounts are true) of those which bring forth young."

* Essad-Bey, *The Twelve Secrets of the Caucasus*, New York, 1931, pp. 264-6.

* Ch. 11.

Notes

The belief, however, probably antedated even Democritus for it is one widespread among many peoples of many climes.

Avicenna (11th century A.D.) says that if the selenite of Arabia is hung on a tree, it breeds other selenites. Much later Savonarola and Cardanus believed that stones reproduce other stones. Albertus Magnus, however, did not believe that precious stones lived as they lacked alimentary organs. The Chinese had the idea by the 16th century that stones reproduced themselves. Among the Carib Indians of British Guiana it is believed that two stones breed provided they are content with the incantations of the medicine man who owns them.

St. Colman's well, parish of Drumaul, County of Antrim, Ireland, is cleaned each twilight. After saying numerous Paters, Aves, and Credos next morning, "small transparent stones of an amber color" are found in it which (if you believe them) "grew there the night before."* Richardson, being an iconoclast, adds "These Stones are to be found there at any Time yet the Natives thereabouts will not be convinced of it." The stones preserved the owner from loss "by fire or water."

Scylax of Caryanda (521-485 B.C.) states that gold was eternally engendered in the waters of the Pactolus River, Asia Minor.* Aristotle believed that new gold was formed in the tailings of the alluvial gold mines of Philippe, Trace, and he mentions new gold spurt-ing from buried gold coins. As to copper, he says at Tyrrhias, Cyprus, "Copper is produced in like manner: for men having cut it up as it appears, in small pieces, sow it and then when the rains come on, it grows and springs up, and is so collected." The Chileans believe that gold is created in those placers which have once been worked. Of course, the true explanation is that further gold particles are set free by the decomposition of pyrite.* The Tibetans of today hold that nuggets and gold in seams are the parent of gold dust and, in consequence, in theory at least only recover the dust.* David Livingstone tells us that the Negroes of Manica-land in his time buried a grain of gold, confident that

* Richardson, *The Great Folly—of Pilgrimages in Ireland*, 1727, p. 65.

* *Apud Hudson*, Vol. I, p. 14.

* John Miers, *Travels in Chile and La Plata*, London, 1826, Vol. II, pp. 412-31.

* David MacDonald, *The Land of the Lama*, Philadelphia, about 1926, pp. 25-6.

in time it would produce a payable placer. We can understand Cadamosta when he said almost 500 years ago that "the natives of the Gold Coast and of French Guinea believed that gold grew" but when he adds "it was mined by gigantic ants" he doubtless mixed geographic data and incidents of a youthful classical education.*

Early in this century, W.W. Young, one of the gold panners of Brown County, Indiana, scoffed at the theory that the gold was brought there by glaciers. He declared it "was born and raised right there."*

Sir John Mandeville* says of diamond "And they grow together, male and female. And they be nourished with the Dew of Heaven. And they engender commonly and will bring forth small Children, that multiply and grow all the year. I have often assayed that if a man keep them with a little of the Rock and wet them with May-dew oft since, they shall grow every year and the small will wax great." Mandeville here confuses two myths, the reproduction story and the birth of pearls when dewdrops fell into open oyster shells, a popular myth of his time and earlier. A Portuguese physician who had lived in India, Garcia da Orta,* states that the diamonds of India are "generated almost on the surface of the ground and come to perfection in an interval of two or three years." Two years after gravel has been mined "mining in the same place you will again find Diamonds."

George F. Kunz* notes that Francisci Rueus† wrote in 1566 that a nobleman had two diamonds that reproduce. The diamonds propagate as "the celestial energy in the parent stones, qualified by someone as *vis adamantifica*, first changed the surrounding air into water, or some similar substance, and then condenses and harden this into the diamond gem." Linschoten* says that after the Borneon diamond placers have been worked out "within three or four years after, there are diamonds found again in the same place which grow there." Boetius De Boot (1690 A.D.) mentions two diamonds which left a large family. Referring to the diamonds of Bisnager, India, Thomas Nicols* follow-

* *The Voyage of Cadamosta*, Hakluyt Soc. translated and edited by G. R. Crone, 1937, intro. p. 16.

* W. S. Blatchley, Dept. of Geology and Natural Resources, 27th Annual Report, Indianapolis, 1902, p. 25.

* *Voyage and Travels*, edited by Arthur Layard, New York, 1899, p. 98. A geographic compilation of the 14th century; the compiler stole from a number of works.

* *Colloquies on the Simples and Drugs of India*, translated by Sir C. Markham, London, 1913, p. 34, original 1565.

* *The Curious Lore of Precious Stones*, Philadelphia, 1913.

† *De Gemmis Tigur*, f. 4.

* *Voyage of Linschoten to the East Indies*, Hakluyt Soc., Vol. II, p. 137.

* *A Lapidary or The History of Pretious Stones*, Cambridge, 1652, p. 50.

Notes

ing De Boot says "when the upper part of the mine is exhausted after two years new Diamonds are brought forth and perfected."

Johannes Bustamantius (17th century) describes two diamonds which were married and were blessed by offsprings. Sir Robert Boyle was an earnest adherent of the idea that gems grew. Dr. A. Petzholdt* claimed he had proof that diamonds have formed recently. A century ago the Brazilian diamond miners believed the myth although some of the more capable operators, like Captain D'Almeida, realized that the stones won from old tailings were those not recovered in the first treatment.* Today in the market at Belize, British Honduras, lucky stones are sold which are highly prized by the Negroes. These are small pieces of iron ore which, if kept in a box in the dark and if fed regularly, iron filings are said to breed.* Among other questions asked Sir Philiberto Vernatti, resident in Batavia, by the Royal Society of London was "do diamonds grow again after three or four years in places where they have been mined": His answer, "Never, or at least as the memory of man can remember."* Robert de Berquen (1669) also states his absolute disbelief in the tale.

Among the ruby miners of Badakhshan it is believed that two large stones always occur together; "the workmen will often conceal a gem till its mate can be found or breaks a large ruby into two pieces."*

The gem miners of Ceylon often rework gem gravels as precious stones "grow in them." Flawed stones and star sapphires have been in the ground too long: they are overripe.

The Chinese, working the tin mines of the Federated Malay States, hold that tin ore is alive and grows and multiplies. If they put their ear to the ground they hear faint tinkling, indicating that the tin is happy. Every precaution is taken to leave it in peace. Some miners believe firmly that tin runs about like quicksilver and makes noises like an insect.* The Chinese are persuaded that coal, once mined, replaces itself in

* Jameson's *Journal*
No. 68.

* George Gardiner,
Travels in the Interior of Brazil, 1836,
41.

* Thomas Gann, *Ancient Cities and Modern Explorations and Adventures in Mayaland*, New York, 1926, p. 22.

* Sprats, *History of the Royal Society*, 1667.

* Lieut. Alexander Burnes, *Travels into Bokhara*, London, 1835, Vol. II, pp. 177-8.

* S. M. Middlebrook,
Mining Journal, London, 1940, p. 527.

thirty years; iron and gold require a longer time. The Malays believe ores have souls.

Some limonitic geodes in the United States are called rattleboxes, as they make a noise when shaken: our contemporary American's reaction to Pliny's description of the *gassidane*.

* *Musaei Metallici*,
Book IV, Ch. 17, p.
604.

3. *Glossopetra*: Aldrovanus* shows a drawing of a flint arrowhead, calling it a *glossopetra* or serpent's tongue. The weight of evidence, however, indicates that *glossopetra* usually was a fossil shark's tooth.

* *Dairy*, edited by Wm.
Bray, London, p.
336.

John Evelyn, under date of July 23, 1669,* writes: "At the Royall Society were presented divers glossa-petra and other natural curiosities found in digging to build the Fort at Sheerenease. They were just the same as they bring from Malta, pretending them to be viper's teeth, whereas, in truth, they are of a shark, as we found by comparing them with one in our Repository."

* F. E. Elsworthy, *The
Evil Eye*, p. 211, etc.

Fossil shark's teeth were very popular in the Middle Ages as amulets and *materia medica*.*



CHAPTER LX

1. *Heliotropium*: The statement of the magicians that *heliotropium* (our bloodstone) renders one invisible is but the restatement of an old myth. The Babylonians (say 3000-2000 B.C.) mention a stone, possibly a cat's-eye, which renders one invisible to his enemies. The earliest Greek form is that of the story of the ring of Gyges referred to by many classical authors, a story which at a later time might have been told by Rabelais. Plato* (died about 350 B.C.) states that when Gyges turned his ring inwards he became invisible, when the stone was turned outwards he again became visible.

* Bohn edition, Vol.
II, p. 38.

Other rings that render one invisible are found in Arabic literature as early as the 9th century, later in Tunis. The ring tale was retold in Europe in the Early Middle Ages, the dwarf of Pope Sylvester II having a

Notes

ring with this property. The old Shahs of Persia are supposed to have possessed a gold casket studded with emeralds which had been blessed by Mohammed. So long as the Shah remained a celibate this casket rendered him invisible! Camillus Leonardus states that the bearer of the *beliocularis* (possibly eye agate) is invisible in battle. Among the gems that were supposed to render their owners invisible were the diamond,* the "ravenstone," (Europe, Middle Ages) and the opal.* The stone *alectoria*, found within a chicken, had the same property according to the Hellenistic Damigeron (between 100-500 A.D.).

2. *Hephaestitis* is the stone of Hephaestus, the Greek equivalent of Vulcan. In the book of Cryamides, an Alexandrian lapidary, written between 227 and 400 A.D., it is stated, however, that *hephestite*, called also "pyrite," when engraved with certain symbols has medical virtue,** Both pyrite and garnet have been used as mirrors, as has rock crystal when properly backed. The discovery of our type of mirror, however, presumably postdates Pliny's time. Marbodius' description of *hephaestitis* suggests however, garnet rather than rock crystal.

Hephaestitis, while probably garnet, is less likely crystal or pyrite. (As to cooling water see note under *Achates*.)

3. The *hammonis cornu* is evidently our ammonite. The name of the fossil is derived from the Egyptian god, Hammon or Ammon, to whom the ram was sacred. It was so named because of its resemblance to a ram's horns. In certain of his coins, Alexander the Great wears ram's horns on his head. In the text, we have the age-old confusion of Aethiopia and India.

The ammonite is considered sacred in India as the Brahmins regard it as a metamorphosis of Vishnu. It is one of the sacred symbols of that god. Each Brahmin must possess one and it is a priceless heirloom handed down from father to son. Any house without its *sala-grama*, an ammonite from the Gandak River, is according to the Atharva-Veda impure as a cemetery and food prepared therein is unclean. Water in which the

* Boniface, 14th century and Nostradamus.

* Marbodius, 11th century and the Englishman Bateman, 1584.

* Mely, *Les Lapidaires de L'Antiquité, Grec.* Vol. III, p. 45.

* Abbe J. H. DuBois,
Hindu Manners, Customs and Ceremonies,
third edition, Oxford,
1906, pp. 648-9.

ammonite has been washed has wonderful purifying qualities.* Indeed if one touch the ammonite—or better drink the water in which it has been placed—one's sins are forgiven.

The marriage ceremony is a popular Hindu form of religious devotion and a *salagrama* may play the bridegroom. The Hindu ascetics, called Dandis, always carry one about them.

The coat of arms of the town of Whitby, England, consists of three ammonites. Sir Walter Scott in *Marmion* retells how St. Hilda, the Abbess of the local Abbey known by her name (founded in 658 A.D.), rid the region of snakes at the request of the peasants:

*"And how of thousand snakes, each one
Was changed into a coil of stone
When Holy Hilda prayed."*

The dying "snakes" must have suffered keenly to be coiled so tightly.

4. *Haematitis*: This is probably our hematite but may be a blood-red jasper. Our hematite, however, can certainly be identified with Pliny's *haematites*.* In the latter place he vaunts its virtues as a remedy against various types of loss of blood. The ancient Ebers papyrus of Egypt long before credited hematite with this virtue. In the Middle Ages and later, red jasper was preferred to staunch the flow of blood, its adherents being Camillus Leonardus (1502), the Indians of northern South America—according to a traveler who wrote in 1574—De Boot (1690), and the Italian peasants of today. A jasper potent for this particular purpose was stolen from the house of the Earl Marshall of England in 1624. Bloodstone or heliotrope had the same virtues, according to many authorities, Camillus Leonardus and Robert Boyle (1672), and the Indians of New Spain in 1580. Others, however, favored quartz, including Robert Wilson (died 1620). The mountaineers of Georgia still think quartz applied to the nose will stop nosebleed. Carnelian has the same virtue per Marbodius (1067-81), De Laet (1647), and some people of today. Emerald steeped in water is also efficacious, according to Psellus, a Byzantine

* Book XXXVI, Ch. 38.

Notes

of the 11th century, and Hermes Trismegistus (1557). Various other stones were supposed to have this virtue, for example, agate (Ben Adloulah); malachite (De Boot, 1690); zircon (the Germans in the 18th century); and amber (Culpeper, 1654). It will be noted that most of these stones are of a color approaching blood and the idea is evidently a mnemonic one.



CHAPTER LXI

1. *Idaei-dactyli*: Michael Psellus, the 11th century Byzantine, held that the *idaeus-dactylus* caused the embryos of legitimate copulation to survive, all others to die.

Western Indians of North America consider the fossil mollusks known to the scientists as belemnites as very powerful "medicine." The Indians call these fossils thunderstones, for they believe the cylindrical objects fall from the sky during thunderstorms.*

2. *Jovis gemma*: Probably meerschaum, the mining of which is supposed to date back to the days of the ancient Greeks.*

* A. Hyatt Verrill, *Strange Customs, Manners and Beliefs*, Boston, 1946, p. 86.

* N. M. Penzer, *Mining Magazine*, Aug., 1919, p. 69.



CHAPTER LXII

1. *Leucophthalmos*: Eye agates in Roman times must have been a powerful counter against the evil eye.

2. *Libanochrus*: This reminds us of a statement in Strabo as he quotes Megasthenes: "Stones are found there (India) of the colour of frankincense and sweeter than figs or honey."* Megasthenes evidently considered rock candy a variety of rock crystal.

* Strabo, Book XI, Ch. 37.

CHAPTER LXIII

1. *Medea*: Medea was the enchantress of Colchis.
2. *Mormorion*: Is our morion, deeply colored smoky quartz. The latter name is derived from *mormorion*.



CHAPTER LXV

* *Polymnia* VII, 69.

1. *Ostracias*: Doubtless flint. Pliny states it is so hard that its fragments are used to engrave seals. Herodotus* states that the Aethiopian warriors tip their arrows with a sharpened stone "of that sort with which they engrave seals."
2. *Obsidianus* stone: See *Obsidianus* notes, appendix.



CHAPTER LXVI

1. *Paneros*: The myth that women become pregnant by swallowing stones is found not only on the Eastern but also on the Western Hemisphere. The good Bishop Epiphanius (390 A.D.) states that if women drink *lygrion* dust, they become pregnant. The Toltec chronicles state that Chimalman, the mother of the King Quetzalcoatl Chalchiuitl (reigned about 839 A.D.), became pregnant from swallowing a piece of *chalchihuitl* (jade).



CHAPTER LXVII

1. *Selentitis* (probably selenite): Pliny states the moonlike play in *selenitis* changes with the various phases of the moon. The statement is repeated by Marbodius (1067-81 A.D.), Pope Leo X (1513-1521), and four or five writers on precious stones in the 17th cen-

Notes

ture. Through either a confusion in translation or in mineral identification, the *Honest Jeweller* (17th century) ascribes this virtue to topaz, and Nicols (1652) to peridot. Dioscorides, on the other hand, states that *selenitis* is also called *aphroselenon* (or "moon-froth") "because it was found at night while the moon was on the increase."



CHAPTER LXXII

1. *Lycophthalmos*: While an entirely different stone, moonstone is locally called wolf's-eye in the United States.*

* W. T. Schaller, *Min. Resources*, USGS, Washington, for 1917.

CHAPTER LXXIII

1. *Chalazias*: Pliny's description and the semimyth of the coolness reminds us of ballas, but it is almost certain that this form of diamond was unknown in Pliny's time.

2. *Enhygros*: Claudian, the Roman poet who flourished about 400 A.D., composed nine poems on the *enhygros*, some in Latin, others in Greek. In one,* he states that Alpine ice could not convert all the water into stone,

* Epigram 8.

"Some tell-tale drops still linger in its womb"

*"Whilst stored within it from creation's birth,
The treasured waters add a double worth."*

Again:

*"Erstwhile the boy, pleased with its polish clear,
With gentle finger twirl'd the icy sphere,
He marked the drops pent in its stony hold,
Spared by the rigour of the wintry cold."*

3. *Dentritis*: This legend, of a stone buried beneath a tree preventing the axe which is to cut it down from becoming dull, is an old one and found rather widely over the world.



A ROMAN BOOK ON PRECIOUS STONES

CHAPTER LXXIV

1. The stone presented to Alexander the Great was probably an unusually fine agate. (Pliny here copies from Theophrastus.*) Theophrastus has just described the agate, a stone in his time highly prized. Theophrastus adds it was cut as a seal at Tyre.

* *History, of Stones,*
art. 59.

Cochlides: Judging from the Latin root of the name, had something to do with snail shells. In Claudian's time,* (4th century A.D.), the Romans decorated their harness with gems.

* *Panegyric on the*
Fourth Consulship of
Honorius, line 796.



CHAPTER LXXV

1. Gem Imitations: See Introductory Chapter 10.

2. The Romans concocted sardonyses of different colored stones and glasses. The Portland vase for a time was believed to be a sardonys; hence the *sardonyses veri* of Martial.*

* IV 61,6; IX 60, 19.



CHAPTER LXXVI

1. The Acesius was a river in Russia near the Dneiper.

Notes for Book XXXVI

APPENDIX

GAGATES (JET)—CHAPTER 34

1. Jet in German is today *gagat*.

While Pliny apparently did not know of the most important source of jet, England, Solinus of the 3rd century A.D.* states that in his day England was an important producer. The Beaker Folk of England (about 1200 B.C.) had buttons of jet and amber. Jet buttons (the jet probably from Whitby) have been found in tombs of the British Early Bronze Age together with Egyptian *faience* beads of the 18th and 19th Dynasty. This suggests that English jet was mined as early as about 1500-1400 B.C.* The Romans opened up the British mines and shipped jet to Rome.* Some say it was sent to Rome in Caesar's time.* Jet bangles made of Whitby jet, and at times from the inferior black product of the Pierbeck range, have been found in Roman houses dating from the occupation period.* While Pliny appears to have been ignorant of it, Whitby was doubtless producing some jet in his time. Whitby as a source of jet is mentioned by Solinus and by Caedmon (about 658-680 A.D.). Marbodius, just before he became Bishop of Rennes late in the 11th century, published a *Lapidarium*. He gives Britain as a source of jet. The ancient Britons also mined and shaped a similar material, cannel coal, and Kimmeridge coal.

2. Pliny is right as to the unpleasant odor of jet when vigorously rubbed.

3. Pliny is, however, wrong when he states water ignites it and oil quenches it.

4. Strabo,* who wrote a century before Pliny, states that Mesopotamia produces the stone called *gangitis* which drives away reptiles. A much later authority, "the Venerable Bede," (8th century) says that jet from Britain "when heated, drives away serpents." The fol-

* Ch. 22, art. 19.

* Mackenzie, *Early Man in Britain*, p. 106.

* Alexander Del Mar, *Ancient Britain*, p. 21.

* R. G. Collingwood and N. L. Meyres, *Roman Britain and the English Settlements*, Oxford, 1936, p. 70.

* Bertram A. C. Windle, London, about 1924, p. 173.

* Book XVI, Ch. 1, Para. 24.

lowing report the same: Marbodius (1067-81) and two 13th century Arabs, Ibnu'l Boitar and Tiefeschi.

The English up to the 19th century believed that jet banishes serpents and they believed that it, mixed with the marrow of a stag's bones, heals snake bites. The belief among the English up to the 18th century that jet drives away devils is perhaps not an unnatural variant of the myth.

Dioscorides states that the fumes of *gagates* "discover epilepsy."*

* op. cit., Goodyer-Gunther edition, p. 653.

5. Albertus Magnus (1193-1280), Camillus Leonardus (1502) and Cardanus (1540) state that an effusion of jet makes a woman who has known men void foul urine; it has no effect on a virgin. Dioscorides* gives an amusing variant of the myth, namely, that if magnetite is secretly placed in the bed of a chaste woman, she embraces her husband; if not above reproach, the woman will fall out of bed. Bartholomew Angelicus repeats the yarn.

* op. cit.

6. Pliny states that a decoction of jet and wine cures toothache. Growing out of this statement, doubtless Bartholomew Angelicus (1495) states that ailing teeth were cured by jet. On the other hand, Camillus Leonardus (1502) holds that loose teeth can be rendered firm by jet powder. Our friend Chaucer (1340-1400 A.D.), while he does not specify jet, evidently refers to it when he speaks of a precious stone.*

* *Romaunt of the Rose.*

*"That hool a man it could make
Of Palasye and of tooth-ake."*



CHAPTER LXVII

1. Obsidian was used by primitive man as early as 50,000 to 25,000 B.C.

2. The close relationship of glass and obsidian (volcanic glass), recognized by Pliny, is a remarkably keen inference arrived at before the chemical similarity of the two was proved.

3. As to Pliny's statement that obsidian comes from Aethiopia, the Egyptianized Greek merchant who wrote, about 60 A.D., the *Periplus of the Erythraean Sea** says it is only found in a harbor on the Red Sea, which Schoff identifies with Houakil Bay (14° 44' N., 40° 49' E.).* Arrian, the Greek (born about 90 A.D.), also mentions the occurrence of obsidian on the shore of the Red Sea south of Adule. It also occurs on one of the Abail Islands not far from Massowah.* It is found not only on the shores of the Red Sea, but in Pantelleria (off the African coast), in the Pontine Archipelago, in the Camp Fligrei, in Sardina, etc.

4. Obsidian is still used to a small extent in jewelry.

5. Obsidian occurs in masses and, in consequence, can be cut into relatively large statues.

6. Spain, "which borders on the ocean," is our Portugal.

* Translated by W. H. Schoff, London, 1912, p. 23.

* Also Henry Salt, *A Voyage into Abyssinia*, pp. 190-4.

* Viscount Valentia George, *Voyages and Travels to India, Red Sea, etc.*, London, 1811, pp. 412-3.





Index

A

- Achates*, 172.
Aeschylus, credited, 4, 128.
Adamas, 137.
 Aethiopian gold mines, Agatharchides on, 15.
Aetites, eagle-nest belief, 20-1.
 Afghanistan, source of gemstones, 49.
 Afghanistan lapis lazuli, 66.
 Agate: beliefs concerning, 173-4, 321; Chinese test for, 306; cups, 33; described as included under *murrha*, 122, 217, 220; Indian mines, 213; Indian, mining of, 78; Oberstein deposits, 53; of Pyrrhus, 116; Ratnapura locality, 272; red variety, 177; scenes in, 207; scented, 18; Sicilian mines, 213; size, 173; sources, 55, 60, 173, 290; unusual uses, arrowheads and spears, 84; mortars, 85; value change, 70, 172; with "portrait" in Florentine Galleria, Hope Collection and Imperial Museum, Vienna, 207; Yemen mines, 213.
 Agatharchides: *Fourth Book of Stones*, 11; on Aethiopian gold mines, 15.
 Alabanda cutting center, 40, 52.
 Alabaster: belief concerning, and described, 174; used in buildings, 144.
 Alexander Polyhistor, credited 4, 9.
 Alexander the Great, influence of conquests on commerce in gemstones, 64.
 Almandite, 152.
 Alum slate, described, 185.
 Amazon stone, ritualistic use, 180.
 Amber: Baltic, 49, 56-8; beliefs concerning, 19, 22, 128-132, 135-6, 241, 257, 321; cleaning, 133; combustibility, 17, 132, 134, 135, 238; commercial importance, 56; cups, 218; described, 129, 133-4, 190; dyeing, staining of, 82; exported to China, 68; fad for, criticized, 134-5; history of trade, 57-9, 60; imitation of amethyst, 74, 82, 136; inclusions in, 18-19, 240; necklaces, 31; odor, 18, 132, 240; price, 74; properties of, 133-6, 240-1; Sicilian, 58, 59; sizes, 133, 238; sources, 55, 57, 58, 59, 212, 233-38; suet treatment, 134; unusual uses, amphitheater nets, gladiators' armor, biers, 133, lamp wick substitute, 134, "perfume," 240; value to primitive man, 57; weight compared to water's, 16.
 Ambergris, described, 175.
 Amethyst: beliefs concerning, 12, 165-6; described, 165, 189; imitated, 74, 136; sources, 51, 164.
Amethystos, 164.
 Ammonite, beliefs concerning, and described, 182.
 Amulet, *see* Bulla.
 Anklets, 31.
Anthracitis, 155.
 Antwerp Diamond, The, 248.
 Apion, credited, 4, 10, 145.
 Apollonides, gem engraver, 40, 118, 209.
 Appuleius, gem engraver, 41, 208, 209.
 Aquamarine, 146; of Treasury of St. Denis, 269.
 Arabia, importance in commerce, 61.
 Archelaus, King: credited, 4, 5, 7, 133, 153, 158; *First Book of Stones*, 11; mining interests, 79.
 Archimedes, and specific gravity, 15.
 Armlets, *see* Bracelets.
 Arrowheads and axes, 176; lore of, 298-302.
 Artificial stones, *see* Imitation stones.
 Asarubas, credited, 4.
 Asbestos: classified, 12; described, 175; price, 73.
 Asia, superiority in commerce, 49-50.
 Assembled stones, 195.
 Association of gemstones, 19.
Asteria, 169.
Astrion, 170.
Astroites, 170.
Astrobolos, 170.
 Authors cited by Pliny: listed, 4; their backgrounds discussed, and evaluation of their knowledge, 5-10.
 Aventurine quartz: belief concerning, 155; described, 156; factors affecting value, 156, and determining price, 72; source, 155.
 Azurite, and malachite, intergrown, 144; described, imitated, and sources, 163-4.

A ROMAN BOOK ON PRECIOUS STONES

B

Badakhshan mines, 64, 213, 291-2.
 Baltic amber, *see* Amber.
 Bangles of jet, 325.
 Bankers, as gem, gold and silverware dealers, 42.
 Barbatus (L. C. Scipio), ring of, 28, 281.
 Barnacles, 188.
 Basalt, described, 177-8.
 Bead necklaces, 31.
 Beads of beryl, garnet, plasma, 39.
 Belemnite, described, 183.
 Beliefs concerning gemstones and other minerals: *Aetites*, 20-1; agate, 174; amber, 22, 128-133, 135; amethyst, 12, 165-6; beneficial to eyesight, 257; beryl, 16, 146-7, 306; best climate for production, 54; buried stones, 323; chalcedony, 175, 180; child-birth aid, 188; climate influences sources, 221-3; coal, 175; coral, 181; dangers of procuring gems, 71; diamond, 12, 17, 21, 138, 139, 252-5, 266, 267, 279, 306, 316-17, 319; emeralds in lion statute, 142; epilepsy cure, 311; falling from sky, 279-80; first gem-set ring, 115; fossil shark tooth, 21; galena, 174; garnet, 22, 175, 179, 277, 311-13; guarantee of invincibility, 306-7; indestructibility, 206; invisibility, 318-19; jasper, 163, 290; jet, 9, 198-9, 325-6; less precious stones as matrices, 302-3; lizards source of, 188; magic powers of, *Lithica*, poem on, 5; magnetite, 188-9; malachite, 161; marble's growth, 20; meteoric iron, 21; meteorite, 186; *murrha's* formation, 20; peridot, 277; power to staunch flow of blood, 320-1; pregnancy aid, 187, 322; "re-productive" stones, 20, 181, 188, 313-18; "ripening," 222, 264-67; rivers and waves, 79; rock crystal, 19-20, 124-5, 224-6; sapphire, 305; selenite, 322; sex of stones, 20, 152, 153, 155-6, 158, 164, 179, 276-7, 313-17; tears, 232-3; transmutation, emerald from jasper, 20, 264; treatments, 80, 144, 154, 171; turquoise, 160, 257, 286; various beliefs, 7, and powers, 173-4.
 Beryl: beads, 39; beliefs concerning, 14, 147, 257, 306; described, 19, 146; faceted, 39, 145-6; flaws, 146-7; imitated, 81, 147; origin, 260, 267-8; shape, 14; sources, 55, 67, 145.
Beryllus, 145.
 Bezaleel, gem engraver, 208.
 Bitumen, described, 177.
 Black Prince's "Ruby," 273.
 Bloodstone: belief concerning, 182, and described, 161, 182.
 Bocchus, Cornelius: authority, Spain, Portugal, 8; credited, 4, 125, 154, 167.
 Bohemian garnet, 53.
Book of Stones, (Nicias Mallotes), 11.

Bornite, described, 144.
 Botryoidal hematite, described, 176.
 Bracelets, Sabine origin of, 23-4.
 Breastplate of the High Priest, 286.
 Bride's jewelry, 31, 75. *See also* Dowry.
 Buffon, Comte. de, on *Natural History*, 3.
 Bulla, customs, and "powers" of, 25-6.

C

Caesar, Augustus, signets of, 118-19, 210.
 Caesar, Julius: gem collector, 46, 119; *Leges Juliae*, 36.
Callaina, 159.
Callistratus: credited, 4, 5, 135, 153; reliability, 8.
 Cameos: famous, 31, 272; origin, popularity, 41.
 Cannel coal, 325.
 Carbuncles, sources, 50; used for seals, 39.
Carbunculus, 152.
Carchedonia, 157.
 Carnelian: described, 19, 157-8; enhanced by foils, 42, 158; for signet stones, 14; quality, 48; sources, 49, 157-8.
Ceraunia, 171.
 Ceylon: indirect commerce with, 67; source of gemstones, 48, 49, 50-1.
 Ceylon pearl, 66.
 Chains, 31.
 Chalcedony: arrowheads and spear tips of, 84; belief concerning, 175, 180; described, 161, 162.
Chalcosmaragdos, 145.
 Chares: credited 4; subject of writings, 9.
 China, indirect commerce with, 67-8.
Chryseletrum, 167.
 Chrysocolla, described, 142, 175.
Chrysolithos, 166.
 Chrysoprase: described, 146, 159, 161; name derivation, 192; size, 161.
Chrysoprasius, 160.
 Chrysolite, described, 159.
 Citrine: associated with rock crystal, 19; described, mining, size, source, 167; value change, 71-2.
 Classification of gemstones: by color, 13, 16, 304; Daubenton's, 51.
 Classification of minerals, 12, 13.
 Cleavage, *see* Properties of gemstones.
 Coal, belief concerning, and described, 175.
Collectanea Rerum Memorabilium, (Solinus), 11.
 Color of gemstones, heightened by foils, 42, 154, 157-8, 167. *See also* Properties of gemstones.
 Combustibility, of amber, 17, 132, 134; of diamond, 252; of jet, 198, 278. *See also* Incombustibility.
 Commerce in gemstones: history of, 56-69.
 Consumer's market, influenced by women, 72, 75, 149.

Index

Coral, beliefs concerning, 181, 266.
 Cornelian law, 24.
 Counterfeiters, attitude toward, 83.
 Counterfeit signet rings, 23, 25.
 Counterfeit stones, *see* Glass imitations; Imitation stones.
 Cronius, gem engraver, 40, 118.
 Cryptocrystalline quartz, described as included under *murrha*, 122.
 Crystal, *see* Rock crystal.
 Crystallography, 13, 14.
Crystallus, 124.
 Ctesias: credited, 4, 130; *First and Second Book of Mountains*, 11; Indian stone authority, 10.
 Cups, *see* Drinking cups.
 Cuts of gemstones, 39, 194-5.
 Cutting and polishing: "best method" to increase brilliancy, 39; ease of handling gemstones compared, 40; flaws hidden by, 40, 126; hardness affects, 15; improving garnets, 40; shapes and styles preferred, 39; tools, 15, 39, 40, 41, 42. *See also* Lapidaries.
 Cutting center for colored stones, Alabanda, 40.
 Cutting centers, confused with mining centers, 52.
 Cuvier, on *Natural History*, 3.
Cyanos, 163.

D

Daubenton's classification of gemstones, 51.
 Democritus: credited 4, 143, 175, 176, 180, 190; knowledge of stones, 8.
 Demostratus: credited, 4, 129, 149, 150; Indian stone authority, 10.
 Derbyshire Mines, 219-20.
 Diadems, 31.
 Diamond: and gold associated, 19, 79, 137, 245-6; beliefs concerning, 12, 17, 21, 138, 139, 252-5, 266, 267, 306, 316-17, 319; combustibility, 252; currency, 288; cutting, 252; cutting and polishing tools using, 15, 85, 139; described, 137-8; duty on, 69; electrical properties, 17, 319, 254-5; engraving uses, 14, 41, 85; etymology of, 242, 243-4; famous, 248; hammer test, 138, 251; hardness, 14, 138, 250, 251-2, and in-frangibility confused, 138, 250; heat conduction, 17; in statuette, British Museum, 242; largest, 71; mines of India, 213; origin, 242-3; rank, 74, 137, 198; size, 137, 138, 247-8; sources, 49, 249-50, (contemporary), 248; structure, 138.
 Dioscorides, *Materia Medica*, 10.
 Dioscurides: gem engraver, 40, 118; importance, 210.
 Dowry, laws against costly jewelry in, 35.
 Drills, 41.
 Drinking cups: agate, 33; crystal, named, 230; extravagant use of, 127, 216, 230;

garnet, 40; gem-set, 121, 213, 215, 217; glass, 127; gold and silver, 216; *murrhine*, 18, 33, 122-4; price, 73; rock crystal, 33; slave freed by destruction of, 230.
 Duties on gemstones, 68-9.

E

Eaglestone, *see* *Aetites*.
 Earrings: belief concerning, 258; class indication, and custom of wearing, 30; extravagance in, 33; pearl, 43.
 Egypt, importance in commerce, 62.
 Electrical properties of gemstones, *see* Properties of gemstones.
 Emerald: beliefs concerning, 20, 140, 145, 166, 257, 264, 265-6, 320; described, 140-3; duty on, 69; Egyptian use, crystals of, 269; faceted, 39; Habachthal mines, 53; hammer test, 251; imitated, 81, 263-4; in lion statue, 142; Ismenias', 76, 117; mining, 261-3; price, 74; rank, 74, 140, 198, 256; restrictions on fashioning, 141; size, 262-3; sources, 48, 49, 53, 141, 143, 260-3; Tyrolese deposits, 53, unusual uses, harness trappings, helmets, 256, lenses, 141, 259, mirrors, 141, 258-9; value, 203.
 Emery, 40.
 Engraved gems: earliest, 23, 28-9; Indian origin, 66; in Egypt, 23; mass production, 60; passion for, 29; value enhanced fraudulently, 209.
 Engravers, *see* Gem engravers.
 Engraving: flaws hidden by, 126; flourished, 29; hardness of stones affecting, 15; height of art of, 41; tools, 41.
 Enhydros: described, 192; inclusions, 18, 192.
 Equestrian rings, 27.
 Etruscan origin of jewelry, 23, 25, 26, 28, 41.
 Euripides, credited, 4, 128.
 Excessive use of gemstones and jewelry: 23-4, 27-8, 29, 31-5, 65, 121-2; laws against, 35-6.
 Eye agate, described, 176.

F

Facets, to hide flaws, 40.
 Fading of gemstones, 16.
 False stones, *see* Imitation stones.
 Fashioning of gemstones, *see* Cutting and polishing.
 File: described, 41; use, 40-1.
 Fillets, 31.
First Book of Stones, (Archelaus), 11.
 Flaws in gemstones: characteristic, 142; hidden, 40, 126.
 Flint, described, 186-7; use, 187, 322.
 Fluorite, *see* Fluorspar.
 Fluorspar: described as included under *murrha*, 122, 219-20; odor, 18; sources, 49, 53.
 Foils: to enhance carnelian, 42, 157-8; gar-

A ROMAN BOOK ON PRECIOUS STONES

net, 154; topaz, 42, 167.
 Foreign authors cited by Pliny, 4.
 Fossil coral, 170.
 Fossil teeth, 21, 181, 186.
Fourth Book of Stones, (Agatharchides), 11,
 Fuchsite, 88.

G

Galena, belief concerning, and description, 174.
 Garnet: beads, 39; beliefs concerning, 22, 153, 155, 157, 175, 179, 277, 311-13; Bohemian, 53; color improved, 40; cups, 40; described, 152-3; enhanced by foil, 154; imitated, 154, by glass, 82; mirrors, 154; necklaces, 53; quality, 48; Rajputana locality, 275; size, 71, 153; sources, 50-1, 152, 153-4, 157; tests for, 15, 154; vinegar treatment, 80.
 Gem, possible origin as "bud," 203.
 Gem cabinets, 119.
 Gem collections: Hope Collection, 207; Northumberland Collection, 28, 281. *See also* Museums.
 Gem collectors: Caesar, Julius, 46, 119; Hadrian, 46; Maecenas, 46; Marcellus, 119; Pompey, 119; Scaurus, Marcus Aemilius, first collector, 119.
 Gem dealers: bankers as, 42; tales of, 78, 252.
 41, 208, 209; Bezaleel, 208; Cronius, 40, 118; Dioscurides, 40, 118, 210; Mnesarchus, 208; Pyrgoteles, 40, 118, 209; Satyrus, 4, 5, 8-9, 10, 128, 151, 153; Theodorus of Samos, 41, 208; social standing of, 44.
 Gem engraving: diamond used in, 139, 254; flaws hidden by, 40; flint used in, 187, 322; height of art of, 40-1, 209; restrictions, 209.
 Gem mining: 77-9; emerald, 261-3; in India, 63.
 Gems, *see* Gemstones.
 Gem setting, 42.
 Gemstones: association of, 19, with gold, 79; classification, by color, 13, 16, 304, Daubenton's, 51; color fading, 16; commerce in, history of, 56-69; cuts preferred, 39, 194-5; duties on, 68-9; excessive use of, 23-4, 29, 31-5, 120-2, and laws against, 35-6; famous deposits, 212-13; flaws, characteristic, 142, hidden, 40; inclusions, 18, 154; industrial uses, 84-6, 139, 254; interest in, compared with that in other minerals, 203; Latin names for, identified with modern equivalents, Table A, 89-101, Table B, keyed to English names, alphabetized, 102-108; less important, discussed by Pliny, alphabetically, 172-190; mining of, 77-9; nomenclature, 13, 190-3; Occidental and

Oriental, 51; occurrence, 19, *in situ*, 78; odors, 18; "portrait," 207-8; powder of, 17, and taste, 18; precious and "semi-precious," 13; prices, 65-6, 73-6; quality, 48, 57; relationships, 13, 146, 150, 171; rank, 74-5, 149, 198; size, 54, 71, 120; sources, 48-55, confused with trade centers, 66, Indian, importance, 66, kept secret, 61, 66, tabulated, 54-5; value, affected by size, 71, enhanced, 71, 72, 78, factors determining, 70-2. *See also*, Beliefs concerning gemstones and other minerals; Cutting and polishing; Engraved gems; Engraving; entries for individual gem names; Glass imitations; Imitation stones; Properties of gemstones; Tests for gemstones and imitations; Treated stones; Unusual uses of gemstones, and other minerals.
 Gem trade, framework of, 43.
 Geode, 177.
 Geographical sources of gemstones, tabulated, 54-5.
 Gibbon, Edward, on *Natural History*, 3.
 Girasol opal, 169.
 Glass balls, magnifying power of, 84.
 Glass imitations: attitudes concerning, 83; detected by grinding, 15, heat conduction, 83, inclusions, 18, 83, luster, 163, 196, obsidian dust, 15, touch, 17, weight, 15-16, 83, 196; indicated by price of jewelry, 73; of garnet, 82, 154; of jasper, 82, 163; of obsidian, 82, 199; of opal, 82, 148; of rock crystal vessels, 73, 127; of ruby, 154; of spinel, 154; of smoky quartz, 168. *See also* Imitation stones.
 Golconda, 52.
 Gold: and gemstones associated, 19, 79, 137, 245-6; bankers as dealers in, 42; beliefs concerning, 35, 175, 267, 308, 313-15; cloth of, 119; drinking cups, 214, 216, and theft of gems from, 46, 214-15; dust of, portico decoration, 289; rank, 76, 198; Pompey's excessive use of, 120; sumptuary laws, and Twelve Tables, The 35-6.
 Golden ball, *see* Bulla.
 Gold ore, Agatharchides on milling of, 15.
 Gold rings, *see* Rings.
 Goldsmiths: guilds, 46; how regarded, 38; on household staffs of emperors, 47.
 Gold ware, gem-set, 214.
 Greek origin of jewelry, 23, 24, 26, 41.
 Groom's gift to bride, 31.
 Guilds, 45-6.

H

Habachthal emerald mines, 53.
 Hair pins, 31.
 Hannibal: gold ring plunder, 26; poison ring, 29.
 Hardness, *see* Properties of gemstones.
 Haüy, Abbe, 15, 16, 203.

Index

Heat conduction, *see* Properties of gemstones.
 Heliotrope: belief concerning, 320; described, 161.
 Hematite: botryoidal, 176; described, "powers," and sources, 183.
History of Stones, (Theophrastus), 5.
 Holland, Dr. Philemon, on scope of *Natural History*, 3.
 Hope Collection, agate with "portrait" in, 207.
 Hungarian opal deposits, 53.
Hyacinthos, 166.

I

Identification, *see* Tests of gemstones, and descriptions under entries for individual gemstones.
 Imitation stones: amethyst imitated, 74, 82; beryl imitated, 81, 147; books on counterfeiting, 80, 83, 195; counterfeiting practiced, 81; emerald and sardonyx imitated, 81; shell ornaments, 193. *See also* Glass imitations; Tests for gemstones and other minerals.
 Inclusions in gemstones, 18-19, 154.
 Incombustibility: of diamond, 17, 139; of ruby, 17, 152. *See also* Combustibility.
 India: diamond mines of, 213; gem mining in, 63, 78; importance in commerce, 61, 63, 65, 66, 68; source of gemstones, 48-9, 50, 145, 66, 147.
 Industrial uses of gemstones, 14, 41, 84-6, 139, 254.
 Intaglios: early use, 23, 29, 31; popularity, compared with that of cameos, 41. *See also* Signet rings.
 Iolite, 88.
 Iris: beliefs concerning, 172, 302; described, 171, 182; source, 172.
Iritis, 171.
 Iron point, 41.
 Iron rings, 24, 26.
 Iron sheet, 15.
 Isaiah, on excessive use of jewelry, 34.
 Ismenias: credited, 4, 5, 150; emerald of, 76, 117; Indian stone authority, 10; reliability, 8; sponsor, gemstones to indicate professional rank, 117.
 Italy, eulogized, 196-8.

J

Jade: belief concerning, 266-7; import, 68; Khotan mines, 213; wine jars, 214.
 Jasper: and malachite, intergrown, 145; beliefs concerning, 20, 145, 163, 264, 290, 320; described, 162, 168, 177, 192; imitated by glass, 82; imitations detected, 163; imperfections, 17, 163; size, 71, 163; sources, 55, 161, 162, 290; with "portrait" in South Kensington Museum, and Walpole's, 207.
Jaspis, 162.

Jet: bangles, 325; beliefs concerning, 9, 198-9, 325-6; combustibility, 198, 278; dangers of mining, 227; described, 188, 198; odor, 18; sources, 49, 53, 227, 325; Whitby mines, 213.

Jewelers: 37-47; economic status, 44; guilds, 45-6; social status, 37-9, 44.

Jewelry: beauty of, 48; belief concerning first use, 115, and warriors' invincibility, 307; bride's, 31; cabinets, 119; custom of wearing, 31, 32; dowry, 33; early attitude of Romans toward, 23-4, 31; Etruscan origin of, 23, 25, 26, 28; excessive use of, 23, 24, 27, 28, 31-4; Greek origin of, 23, 24, 26; imported, sources, 43; Indian origin, 60; laws restricting owning and wearing, 35-6; pawned, 46; Phoenician origin, 61; price of, indicative of imitations, 73; Sabine origin, 23-4, 26; taxes on, 35-6; unusual uses of, bulla, 25-6, rings, 25, 27; votive offerings, 119, 211; variety, worn by women, listed, 31; wartime loan of, as tax substitute, 35.

Jewelry industry: framework of, 37, 43, 44-5; guilds, 45.

Jewelry making, 43.

Jewelry shops, kinds and locations, 42-3.

Job, on mining, 77.

Jovinian, on excessive use of jewelry, 34-5.

Juba, King: credited, 4, 125, 144, 158; authority on gem deposits, 10.

Juvenal, *Satires*, 32.

K

Khotan jade mines, 64, 213.

Knights' rings, 27.

Kohinoor, The, 248.

L

Labradorite, with "portrait," 207.

Lapidaries: method of improving color of garnets, 40; social standing of, 44; tools, 39, 40, 41, 42, 139; trick of renaming treated stones, 194.

Lapis lazuli: Afghanistan trade, 66; Badakhshan mines, 64, 213, 291-2; commercial importance, 56, 292; described, 164; imitated, 292; quality, 48; sources, 164; supposed origin, 291; unusual uses, coloring matter, 291; hones, 84.

Latin names for gemstones and minerals: Table A, identification, 89-101; Table B, keyed to English names, alphabetized, 102-8.

Laws pertaining to gem engravers, gems, gold, jewelry and silverware, 35-6.

Legends concerning gemstones, *see* Beliefs concerning gemstones and other minerals.
Leges Juliae, 36.

Lenses: of emerald, 141, 259; or rock crystal, 84, 228-9.

A ROMAN BOOK ON PRECIOUS STONES

Leros, 172.
Leucochrysos, 168.
Lex Oppia, 35.
 Lignite, described, 188, 191.
 Limestone, belief concerning, and described, 182.
 Limonite, described, 183-4.
Lithica, (ascribed to Onomacritus), 5.
 Lollia Paulina, fabulous jewels of, 33.
 Luster, *see* Properties of gemstones.
Lychnis, 156.
Lyncurium, 136.

M

Maecenas: and Emperor Augustus, 210-11; credited, 4, 5, 8, 79; frog signet, 118; gem collector, 46.
 Magic powers of gemstones, *Lithica*, poem on, 5. *See also* Beliefs concerning gemstones and other minerals.
 Magnetism, 17.
 Magnetite: belief concerning, 188-9; described, 138; magnetic property of, 17; mammillary, 186.
 Malachite: and azurite, intergrown, 144; and jasper, intergrown, 145; beliefs concerning, 161, 321; described, 142, 145, 161, 175; unusual use, circus arena sanding, 289.
 Manufacture of jewelry, 43-4.
 Marble, belief concerning growth, 20.
 Marcellus, gem collector, 119.
Materia Medica, (Dioscorides), 10.
 Medicinal virtues of gemstones, *see* Beliefs concerning gemstones and other minerals.
 Meerschmum, 184.
Melichrysos, 168.
 Merchants, how regarded, 37-8.
 Mesopotamian Valley, importance in commerce, 59.
 Metals, and beliefs concerning them, *see* Gold, Silver.
 Meteorite: 171, 309; beliefs concerning, 21, 186; lore of arrowheads and axes, 297-302.
 Metrodorus: credited, 4, 129, 139, 187; background, 9.
 Minerals: classification, 12, 13; gemstone indicators, 79; Latin names for, identified with modern equivalents, Table A, 89-101, Table B, keyed to English names alphabetized, 102-8; name terminations, 13; origin of, views compared, 19; relationships, 13, 146, 150, 171; resources, 212-13. *See also* Beliefs concerning gemstones and other minerals.
 Mining centers, confusion of, with cutting and trade centers, 51-2.
 Mining of gemstones: 77-9; of sapphires, tale of, 287; of turquoise, tale of, 160.
 Mithridates, credited, 4, 8, 130.
 Mnaseas, credited, 4, 130, geographer, 9.
 Mnesarchus, gem engraver, 208.

Moldavite, 88.
Molochitis, 161.
 Moonstone: described, and source, 170, 171, 186; vinegar treatment, 171.
 Moss agate: belief concerning, 193; described, 192; pictures in, 173.
Murrha: belief concerning formation, 20, 124; cups of, 73, 74, 122, 123, 215; described, 123-4; gem equivalents, 218, and Table A, 90; odor, 18; rank, 198, size, 71, 124; sources, 123-4, 220.
 Museums: British Museum, London, diamonds in statuette, 242; Chicago Natural History Museum, smithsonite in, 263; Florentine Galleria, large turquoise in, 285, and "portrait" agate in, 207; Imperial Museum, Vienna, "portrait" agate in, 207; Museum of Milan, large rock crystal in, 227; Natural History Museum, Paris, large rock crystal in, 227; Royal Mineral Cabinet, Berlin, large amber in, 238; South Kensington Museum, London, "portrait" jasper in, 207; United States Natural History Museum, large rock crystal ball in, 227. *See also* Treasury.
 Myths concerning gemstones, *see* Beliefs concerning gemstones and other minerals.

N

Naïfes, 14, 243.
Names of Rivers and Mountains, The (Parthenius), 11.
Natural History, (Pliny): Buffon and Cuvier on, 3; compared with *History of Stones*, (Theophrastus), 6; Gibbon and Holland on, 3; innovation in classical writing, 4; Pliny's personality revealed in, 2; Pliny the Younger on, 2; scope of, 1-4; value of, in Dark and Middle ages, 3.
 Necklaces: of amber, 31; of garnet, 53.
 Nephrite, Khotan deposits, 64.
 Nero: destruction of Homeric cups, 127, 229; establishes fad for amber, 135; excessive use of gemstones, 121; passion for *murrhine* cups, 122-3.
 Nicander: credited, 4, 128, 156; subject of writings, 9.
 Nicias: amber authority, 8; *Book of Stones*, 11; credited, 4, 5, 18, 130.
 Nicolo, described, 175.
Nilion, 161.
 Nishapur turquoise mines, 213.
 Nomenclature of gemstones, 13, 190-3.
 Northumberland collection, 28, 281.

O

Oberstein agate deposits, 53.
 Obsidian: described, 178, 199; imitated, 82,

Index

199; dust of, in tests, 15, 86, 196; sources, 178, 187, 199, 327.
Occidental gemstones, 51.
Occurrence of gemstones, 19; *in situ*, 78.
Octahedron, Pliny's description of, 14.
Odor of gemstones, 18.
Olivine, *see* Peridot.
Olympicus, credited 4.
On the Twelve Precious Stones, (St. Epiphanius), tale of sapphire mining from, and variants, 286-7.
Onychus, 151.
Onyx: described, 151-2; sources, 273, 290; uses, 23, 274.
Opal: beliefs concerning, 279, 319; depicting Mt. Fuji, 207-8; described, 168-9; flaws of, 148; imitated, 82, 148; of Nonius, 147-8; play of color in, 147, 169; price, 74; rank, 74, 147; size, 147, 270; sources, 49, 53, 147, 149, 169, 270; sun test for, 148-9.
Opalescence, *see* Properties of gemstones.
Opalus, 147.
Oriental gemstones, 51.

P

Paederos, 168.
Parthenius, *Names of Rivers and Mountains, The*, 11.
Paste, *see* Glass imitations.
Pawnbrokers, 46.
Pearls: Ceylon, 66; earrings, 43; rank, 74, 140, 198; sources, 50, 66; unusual uses, actors' masks, 121, altar decoration, 120, helmets and horse trappings, 36, portrait of Pompey, 35, 120.
Pentremite: belief concerning, 189; described, 176, 180, 188.
Peridot: beliefs concerning, 158, 277, 284; described, 158, 178; mining, 282-3; polishing, 15; quality, 48; size, 159; source, 49, 158, 213, and secrecy surrounding, 282; value change, 71.
Persia, source of gemstones, 49.
Persian turquoise: Nishapur locality, 64; trade in, 66.
Philemon: credited, 4, 158; gem engraver, 10.
Philoxenus, credited, 4, 128.
Phoenicia, importance in commerce, 60.
Phoenician origin of jewelry, 61.
Plasma: beads, 39; described, 160-1.
Play of color, *see* Properties of gemstones.
Pliny's gems and minerals, identified with modern equivalents, Table A, 89-101, and Table B, 102-8.
Pliny the Elder (Caius Plinius Secundus): biographical notes, 1; book of, 1; gemstone authority and mineralogist, 12-22; indebtedness to Theophrastus, 7; influence over 1600 years, 12; views on mineral origins, compared with Theophrastus', 19.

See also Natural History.

Pliny the Younger's estimate of uncle, Pliny the Elder; remarks on *Natural History*, 2.
Polishing, *see* Cutting and polishing.
Polycrates' ring, 118.
Pompey: excessive use of gemstones and gold, 120; gem collector, 119; gems shown at triumphs of, 120; introducer of *murrhine* cups, 122; pearl portrait of, 35.
"Portraits" in gemstones, 207.
Powder of gemstones, 17, and taste of, 18.
Prase, described, 160, 161.
Prasius, 160.
Precious stones, *see* Gemstones.
Prometheus' ring, 115, 203.
Price of gemstones: 73-6; compared with today's, 75; factors affecting, 65-6, 73.
Properties of gemstones: asterism, 153, 169; cleavage, 14; color, fading of, 16, and means of classification, 16, 304; electrical, 17-8, 134, 139, 254-5; hardness, 14-15, of diamond, 138, 250, 251-2; heat conduction, 17, 196; luster, 17, 140, 162, improved by honey treatment, 194; opalescence, to detect imitation opal, 82, 148-9; play of color, opal, 147, 169; specific gravity, application of, 16, and Archimedes' recognition of, 15; streak, 15, 17; structure, of diamond, 138, of rock crystal, 126; toughness, 14; Theophrastus' knowledge of, 6; transparency, 16, of carnelian, 158, of emerald, 142. *See also* Combustibility; Inclusions; Magnetism; Translucency.
Pyrgoteles, gem engraver, 40, 118, 209.
Pyrite, described, 178.
Pyrrhus, King, agate of, 116.
Pytheas: amber authority, 9; credited, 4.

Q

Quartz: belief concerning, 320; earliest use for engraved gems, 29; cryptocrystalline, honey and sun treatments for, 80; fetid, odor, 18; sources, 49.
Quartz cat's-eye, described, 170, 176.

R

Rajputana garnet locality, 275.
Rank of gemstones, 74-5, 149, 198.
Ratnapura agate locality, 272.
Relationships of gemstones and other minerals, 13, 146, 150, 171.
"Reproduction": of gems, 20, 181, 188, 313-18; of gold, 313-15.
Retail merchants, how regarded, 37-8.
Ring of L. C. Scipio Barbatus, 28, 281.
Ring of Polycrates: 118; and king of Egypt, 203; claimed found, 206; story variants, 204-6.

A ROMAN BOOK ON PRECIOUS STONES

Ring of Prometheus, 115.
 Rings: and fish, tales of, 204-6; attorneys' and orators' fondness for, 28; belief concerning medicinal value, 25; customs of wearing, 27; gem-set, earliest Romans to have, and Etruscan origin of, 28; indicative of rank and succession, 25; number worn, 27, 28; of gold, equestrian, or knights' rings, 27, granted citizens, 36, Hannibal's plunder of, 26, indication of rank, 26, and of manumission, 27, introduction of, 26, senators', 36, wedding rings of, 26; of iron, 24, 26; of rock crystal, as cooling agents, 17; origin of, 26; poison-containing, 29; price, 73; sardonyx, rented by lawyers, 272; settings, 42. *See also* Signet rings.
 Rock crystal: and citrine associated, 19; beliefs concerning origin as ice, 124-5, 224-6, and as "unripe" diamond, 266; confused with rock candy, 184, 321; cups, 33, 74, 127, 216, 230; Cyprian "diamond," 138; dangers of locating, 126, 227; described, 126, 192; imitation of beryl, 81, 147; of emerald, 81; large specimens in museums, 227; magnifying power of ball of, 84; size, 71, 126, 227; sources, 50, 78, 125, 126, 213, 224, 226; structure, 125-6; uncut crystals set, 40; unusual uses for cauterizing, 86, and cooling aids, 17, 229, lenses of, 84, 228-9.
 Roman jewelry, *see* Jewelry.
 Roman authors cited by Pliny, 4.
 Rome, world trade center, 56.
 Rose cut, popularity, 18th Century England, 81.
 Ruby: Badakhshan mines, 64, 213, 291-2; belief concerning ripening, 266; described, 152, 155, 277; sources, 48, 49, 51, 274; tests for, 15, 154; value, 203.

S

Sabine origin of jewelry, 23-4, 26.
 St. Epiphanius, *On the Twelve Precious Stones*, 286.
 St. John's Island peridot deposits, 282-3.
 Sancy, The, 248.
 Sandastros, 155.
 Sapphire: beliefs concerning, 266, 305; described, 141, 166, 259; Indian origin, 66; mining of, St. Epiphanius' tale of, 286-7; "pictures" in, 207; sources, 48, 49, 51, 67, 295; values, 203; unusual use, horse trappings decoration, 36.
 Sapphiros, 164.
 Sarda, 157.
 Sardonychus, 149.
 Sardonyx: described, 149-51; early use for engraving, 29; imitated, 81, 195; Indian mining of, 78; Indian origin, 40, 66; "pictures" in, 207; Polycrates' ring, 115; quality,

48; rank, 149-50; rings, rented by lawyers, 272; size, 71, 150, 272.
Satires, (Juvenal), 32.
 Satyrus: credited, 4, 5, 8-9, 128, 151, 153; Indian stone authority, 10.
 Scaurus, Marcus Aemilius, first gem collector, 119.
 Seals, *see* Signet rings.
 Selenite: belief concerning, 322; cleavage, 14; described, 20, 188; source, 188.
Self Tormentor, The, (Terence), 32.
 Settings, 42.
 Shapes and styles of stones, 39, 194-5.
 Shell ornaments, 193.
 Sicilian amber, 58, 59.
Siderites, 138, 250.
 Signet rings: Augustus Caesar's, 118, 119; Cornelian law, 24; counterfeiting, 23, 25; earliest, and excessive use, 23; identification means, 24; indicative of rank, 25, and succession, 25, 208; restrictions against engraving, 118, 209; symbolic of secrecy, 24, and of security, 24, 25. *See also* Intaglios; Rings.
 Sillimanite, 88.
 Silver: belief concerning, 35; commercial rank, 76; dust of, for portico decoration, 289; drinking cups, 216; rank, 198; silver-threaded tissue, 119; sumptuary laws, 35-6.
 Silver plate: pawned, 46; popularity increased by conquests, 119; restrictions, 35, 36; Roman Senate's, 33; styles, 72.
 Silverware: bankers as dealers in, 42; gem-set, 214.
 Silversmiths, 45.
 Sinai Peninsula turquoise mines, 213.
 Size of gemstones: affecting value, 71; in chessboard, 120; of several varieties, 71; Public Register record, 54. *See also* entries for individual gem names.
Smaragdus, 140.
 Smithsonite: described, 143-4; in Chicago Museum of Natural History, 263.
 Smoky quartz: described, 185; imitated, 168.
 Solinus, Gaius Julius, *Collectanea Rerum Memorabilium*, 11.
 Solon's laws, pertaining to gem engravers, 23, 35, and dowry ornaments, 35.
 Sophocles, credited, 4, 131.
 Sotacus: credited, 4, 5, 21, 150, 151, 179; Indian stone authority, 10.
 Sources of gemstones: confused with trade centers, 66; famous deposits, 212-13; India's importance, 66; kept secret, 52, 61, 66; Periegetes on, 55; Pliny's accuracy concerning, 52; tabulated, 54-55. *See also* entries for individual gem names.
 Specific gravity, *see* Properties of gemstones.
 Specular stones: cleavage, 14; described, 20; unusual use, beehives, 86.
 Spinel: described, 152; source, 274; tests

Index

for, 15, 154.
 Star garnet, 153.
 Star sapphire: asterism described, 169, 276; sources, 169.
 Steatite, described, 190.
 Streak, *see* Properties of gemstones.
 Structure, *see* Properties of gemstones.
Succinum, 127.
 Sudines, credited, 4, 5, 125, 161, 170.
 Sumptuary laws, 35-6.
 Superstitions concerning gemstones, *see* Beliefs concerning gemstones and other minerals.
 Synthetic rubies and sapphires, effect on value of genuine stones, 231.

T

Tables: Pliny's gems and minerals identified with modern equivalents, Table A, 89-101, and Table B, 102-108.
Tanos, 145.
 Tariffs, 68-9.
 Taxes on jewelry, 35-6, and jewelry war loan substitute for, 35.
 Tenacity of gemstones, *see* Properties of gemstones (toughness).
 Terminations of mineral names, 13.
 Terence, *Self Tormentor*, *The*, 32.
 Tests for gemstones and imitations: "best mode," 15; Chinese test for agate, 306; hammer test, 138, 251; hardness, 81, 138, 196; heat conduction 17, 196; inclusions, 18, 154; luster, 196; opal, sun test, 148-9; streak, 15, 86, 196; touch, 17, 196; touchstone, 15; transparency, time for, 16, 195-6; weight, 15-16, 83, 154, 196.
 Theocrestos, credited, 4, 130.
 Theodorus of Samos, gem engraver, 41, 208.
 Theophrastus: credited, 4, 5, 129, 136, 145, 154; contribution to Pliny's writing, 7, 39; gem expert, 6, 7; some views of, compared to Pliny's, 19.
 Timaeus, the Sicilian: credited, 4, 129; subject of writings, 9.
 Tin: belief concerning, 264-5; commerce in, 58.
 Tools: of engravers, 41; of lapidaries, 39, 40.
 Topaz: described, 136, 166-7; distinguished from imitations, 17, 168; electrical property, 18; foils to enhance color, 42, 167; setting, 42; sources, 51, 166-7.
Topazos, 158.
 Touchstone, use in detection of imitations, 15.
 Toughness, *see* Properties of gemstones.
 Tourmaline: described, 136, 156; electrical property, 18; source, 156.

Trade centers, confused with sources of gemstones, 51-2, 66.
 Trade in gemstones, *see* Commerce in gemstones.
 Translucency, 16.
 Transmutation of gemstones, 20, 264.
 Transparency, *see* Properties of gemstones.
 Treasury, of St. Denis, aquamarine in, 269, and of St. Mark's turquoise in, 285. *See also* Museums.
 Treated stones: amber and suet, 134; cryptocrystalline quartz, fire and sun treatment, 80; dyeing and staining, 82; garnet and vinegar, 80, 154; honey treatment, 80; moonstone and vinegar, 171; renamed to enhance value, 194; satinspar and vinegar, 171; *smaragdi* and oil and wine, 144.
 Trinkets, 31.
 Triplets for imitation sardonyx, 81, 195.
 Triumphs of Pompey, 120.
 Turquoise: beliefs concerning, 160, 257, 267, 286; commercial importance, 56; described, 143, 145, 159-60; fading of, 16; imitated, 82, 292; in Florentine Galleria, and in Treasury of St. Mark's, 285; Nishapur mines, 64, 213, 285; Persian, 66; quality, 48; setting, 42; sources, 64, 159, 213, 285, 289; unusual use, currency, 288.
 Tyrolese emerald deposit, 53.

U

Unusual uses of gemstones and other minerals: actors' masks, 121; altar decoration, 119; amphitheater nets, 133; arrowheads and spears, 84; beehives, 86; boot and shoe decoration, 27, 29; cauterizing 86, 127; chessboard, 120; circus arena sanding, 289; coloring matter, 291; cooling aids, 17, 229; currency, 288; drinking cup decorations, 46, 47; gladiators' armor and biers, 133; helmet and horse trappings decoration, 36, 256; hones, 84; indication of musicians' rank, 117; lamp wick substitute, 134; lenses, 84, 141, 228-9; mirrors, 154, 258-9; "perfume," 240; Pompey's portrait, 35, 120; ritualistic use, 180; votive offerings, 119, 211; wine coolers and jars, 213-14.

V

Value of gemstones: enhanced, 71, 72, 78; factors determining, 70-2, 206; *See also* Price of gemstones; Rank of gemstones.
 Varro, M., credited, 4, 119.
 Volcanic glass, *see* Obsidian.

A ROMAN BOOK ON PRECIOUS STONES

W

Wedding rings, 26, 31.
Whitby jet mines, 53, 213, 227, 325.

X

Xenocrates: credited, 4, 5, 125, 130-1, 199;
 amber, crystal authority, 8.
Xuthon, 168.

Z

Zachalias: beliefs, 8; credited, 4, 5, 133.
Zebirget Island peridot mines, 213, 282-3.
Zenothemis: credited, 4, 5, 150, 151, 171; In-
 dian stone authority, 10.
Zircon, belief concerning, 136, 178, 321.
Zoroaster, credited, 4, 5, 170, 180.







